AUGUST 29, 1931

Railway Age

Founded In 1856

GENEVA COLLEGE LIBRARY,
No.
BEAVER FALLS, PA.

Pennsylvania Railroad Puts 150 New Electric Locomotives On Timken Bearings

150 of the electric locomotives to be built for the Pennsylvania Railroad's New York-Washington electrification project will be equipped with Timken Bearings on all driving wheels and engine truck axles . . . 90 of these locomotives will be of the P-5 class, 3,750 H.P., designed for a speed of 90 miles per hour in passenger service. The other 60 will be of the L-6 class, 2,500 H.P., for freight haulage . . . The selection of Timken Bearings for this important new equipment foreshadows the universal use of anti-friction bearings on all types of locomotives and railway rolling stock . . . This is the largest order for anti-friction bearings ever placed by any railroad at any one time. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* BEARINGS

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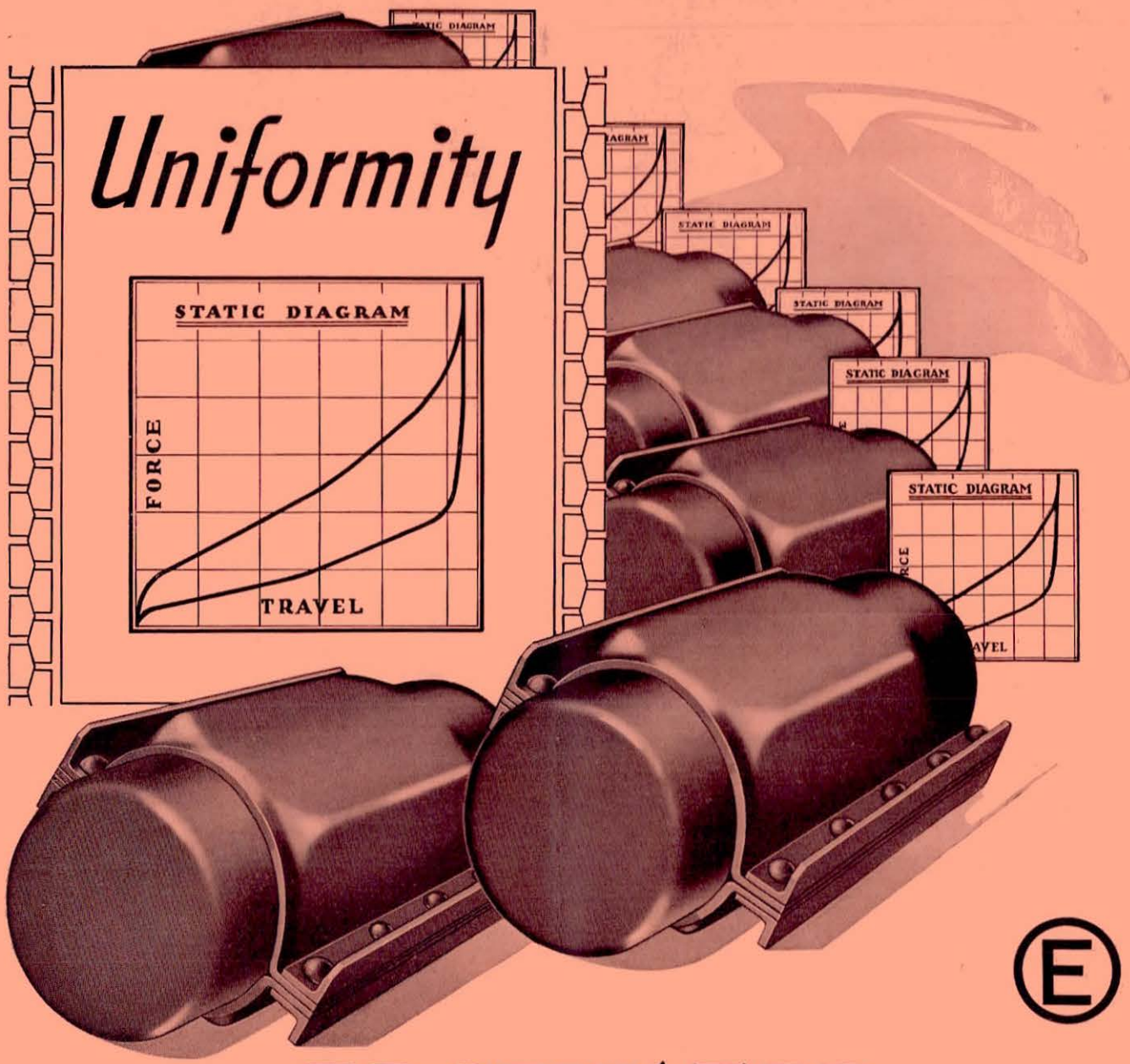

EDGEWATER

Gear after Gear...
with Uniform Characteristics

The lubricated friction surfaces of the EDGEWATER Draft Gear ensure uniformity in characteristics and performance not obtainable in other gears.

EDGEWATER STEEL COMPANY · PITTSBURGH

Sales Offices: ATLANTA BALTIMORE BOSTON CHICAGO KANSAS CITY LOUISVILLE
NEW YORK PHILADELPHIA SAN FRANCISCO ST. LOUIS ST. PAUL SEATTLE WASHINGTON

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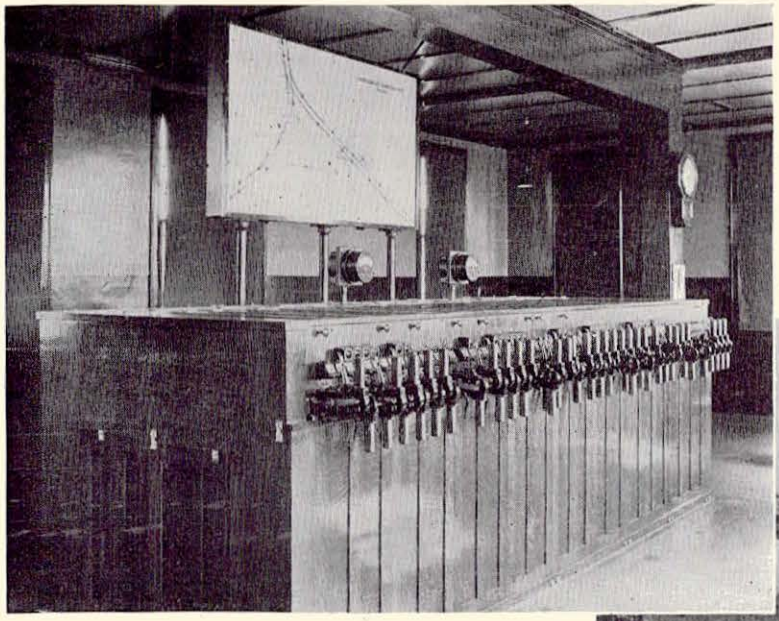
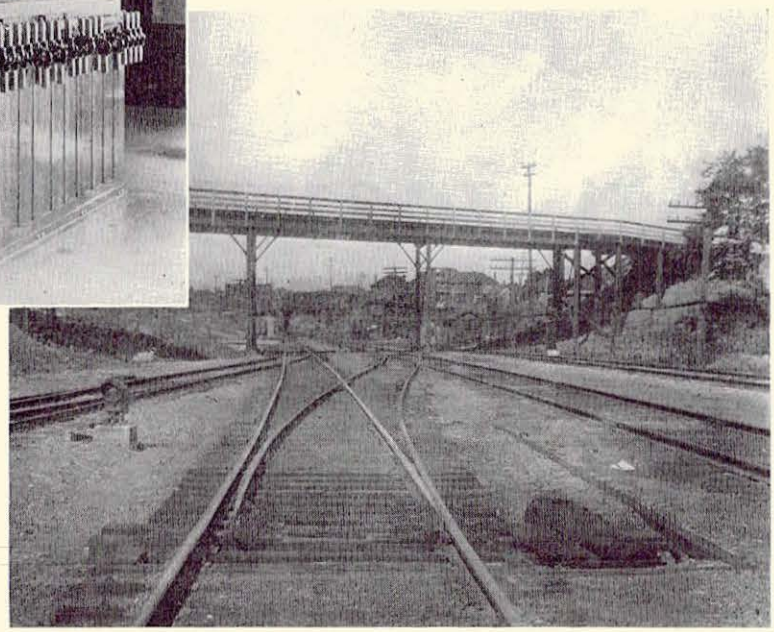




Profit by Toronto, Hamilton and Buffalo's Experience.

Busy enginehouse and shop traffic combined with heavy junction traffic of the Toronto and Waterford divisions of the Toronto, Hamilton and Buffalo Railroad presented a situation to be solved only through the use of power interlocking. A G-R-S All-Electric Interlocking System was chosen for the task. That was in 1907.

Today—after 24 years of satisfactory service—Dundurn Interlocking is undergoing a change. New shops—new enginehouse—new track layout—increased traffic—and again—the G-R-S Electric System is the T. H. & B.'s choice. A new G-R-S machine is now on the job 390 lever movements is the daily average. There must be a reason for selecting the G-R-S System. Satisfactory service from the first machine influenced the purchase of the second.

Why not profit by T. H. & B.'s experience and install the ever economical dynamic indication system—the G-R-S ALL-ELECTRIC INTERLOCKING.

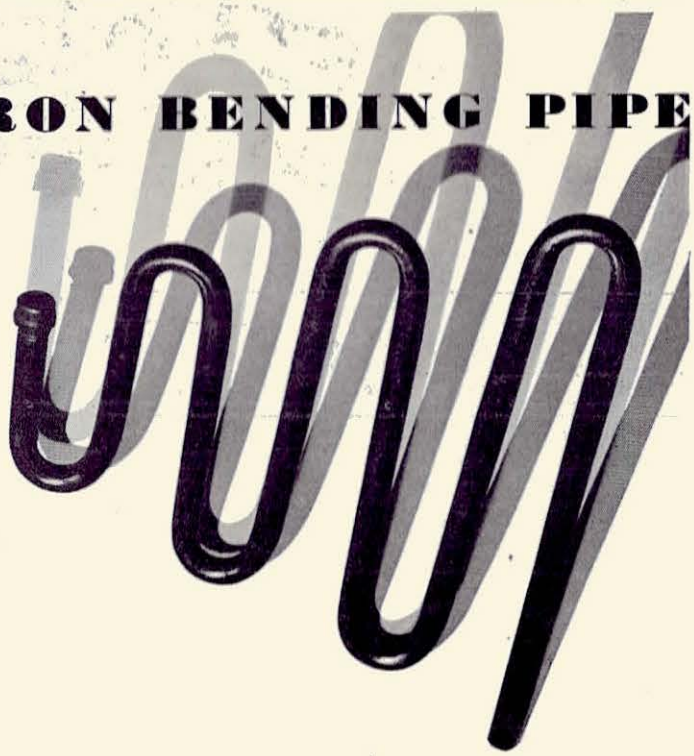
GENERAL RAILWAY SIGNAL COMPANY

ROCHESTER, N. Y.

New York Chicago St. Louis A-851

Affiliated Companies' Offices: Montreal London Paris Tokyo Barcelona Melbourne Calcutta Buenos Aires

THIS WROUGHT-IRON BENDING PIPE



Answers an old Railroad Problem!

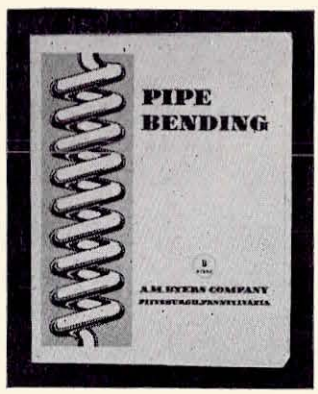
Railroad men have devoted many long hours to the fight against corrosion and vibration-fracture. It's an eternal battle! They've also expressed so persistently a desire for wrought-iron bending pipe to assist them in the solution of these problems that Byers produced it!

And this Byers Bending Pipe met instant and widespread favor in the railroad industry. Its adaptability for installations requiring difficult hand or machine bendings has stimulated repeat orders from many sources. Many results obtained have exceeded our claims for this bending pipe, all based on scientific experiments and actual performance tests.

"You may be interested to know," writes one railroad pipe foreman, "that we bent the extra-heavy bending pipe to center-to-center diameters as low as 3.3 times the outside diameter. This was all cold-bending, and the results were most satisfactory."

There are scores of places where this bending pipe will save time, trouble and money. It's an achievement in wrought-iron manufacture of great importance to the railroad business. Our "Bulletin No. 50" contains much vital information. Write for it today! A. M. Byers Company, Pittsburgh, Pennsylvania.

SEND FOR A COPY



BYERS GENUINE WROUGHT IRON BENDING PIPE

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All communications should be addressed to the New York Office 30 Church Street

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With which are incorporated the Railway Review, the Railroad Gazette and the Railway Age-Gazette. Name Registered U. S. Patent Office

Vol. 91 August 29, 1931 No. 9

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Lehigh Valley Operates All Local Service With Rail Cars 327

Tells how this company, by the use of rail motor cars, has produced, in two and one-half years, average savings, as compared with steam operation, equal to the original motor car cost.

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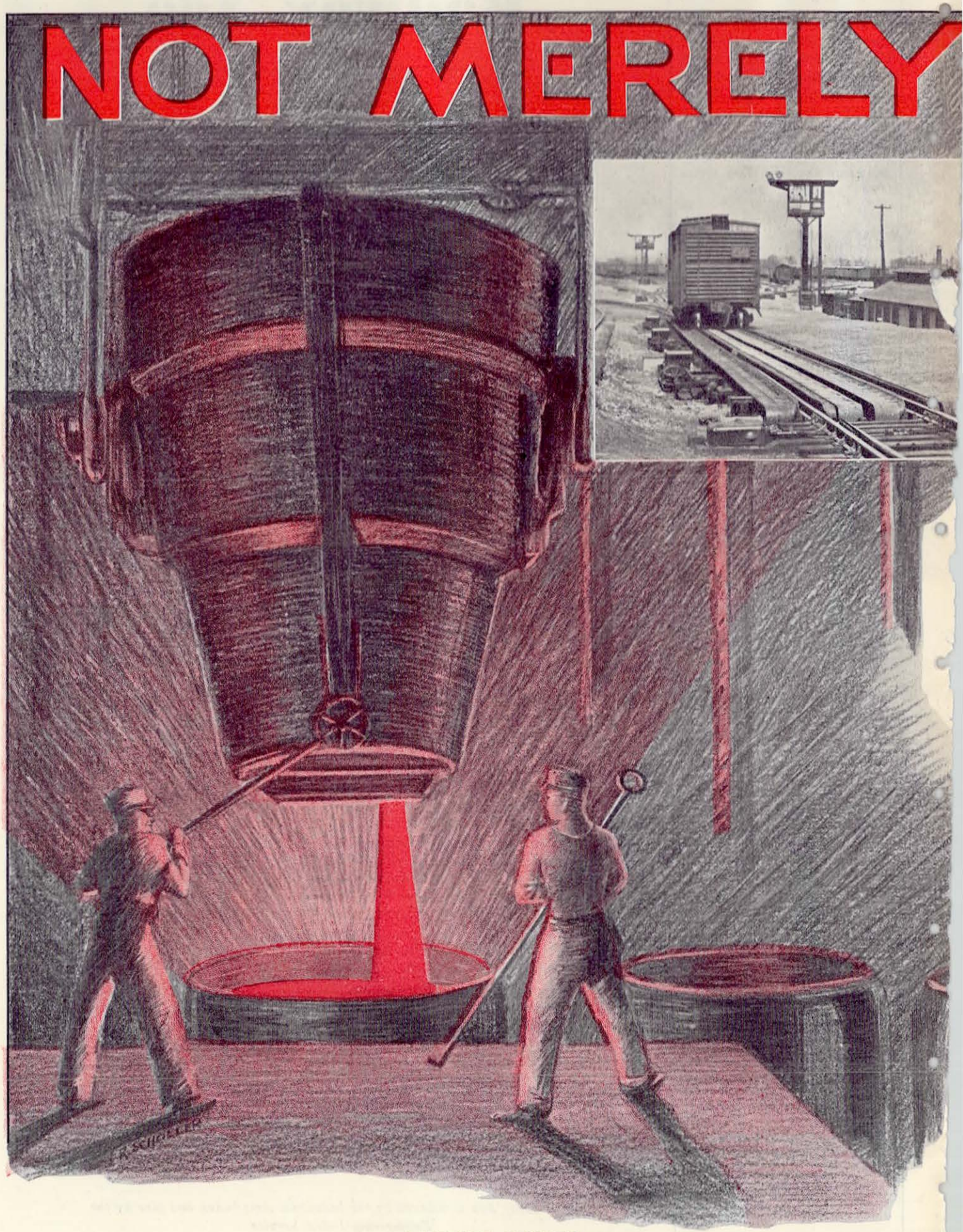
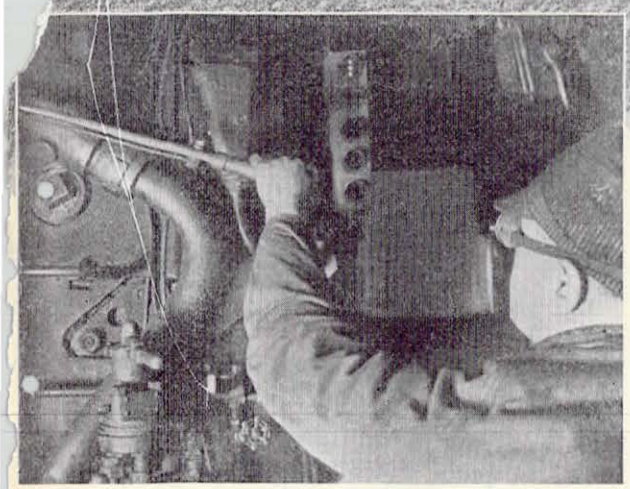
NOT MERELY



—*DISTRICT OFFICES*—

NEW YORK MONTREAL CHICAGO ST. LOUIS SAN FRANCISCO

POUNDS OF METAL



Whether the business cycle is up or down—"Union" engineering and research *must* be continuous to create and provide you with the signaling systems you require to handle traffic in the most economical and safest manner.

Also the individual devices employed in all such systems are vital and important elements, because they must be extremely reliable and be built upon *proven* engineering principles.

When you buy a signaling system you expect that it be reliable; that it be safe; that it be economical in first cost and upkeep and that it will give good service, now and through the years to come.

It is only through our continuous engineering and research by a specialized staff of over 250, regardless of *whether the business cycle is up or down*, that enables you to capitalize upon your signal investment. When you specify "Union" systems and materials you are buying not *merely pounds of metal* but engineered systems and devices which are built *up* to a standard, not down to a price.

1881 TRADE MARK **Union Switch & Signal Co.** TRADE MARK 1931

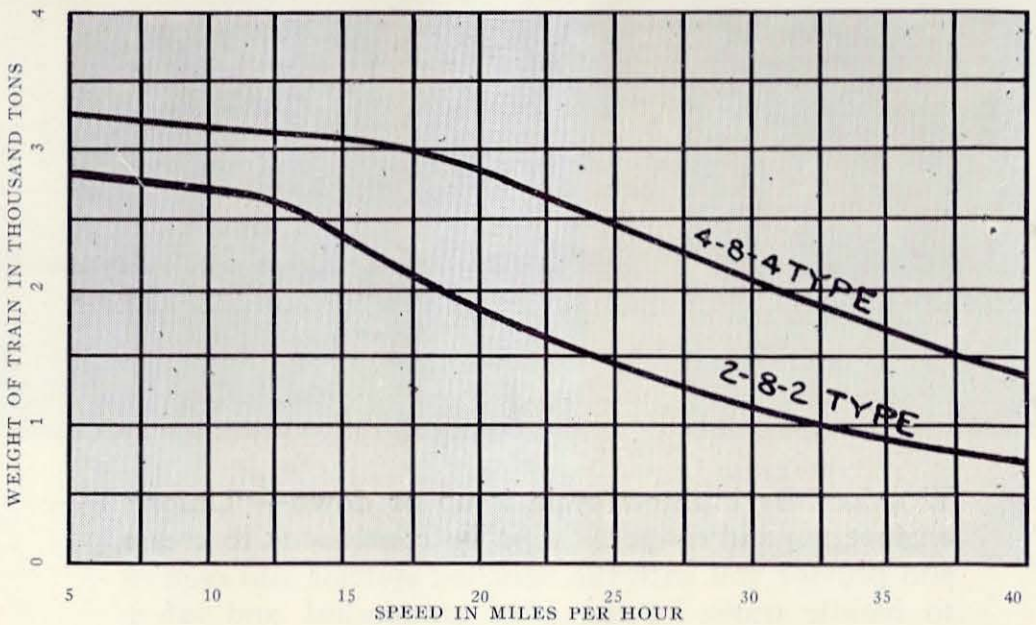
SWISSVALE, PA.

Speed *and* Tonnage

MANY an operating officer is today struggling with the question—Speed *or* Tonnage? Why? Because, with much of the motive power at his command, he cannot have both.

Yet the right answer is Speed *and* Tonnage, and it is available right now—but only in the strictly modern locomotive.

The chart compares a typical 2-8-2 locomotive of ten years ago with a typical 4-8-4 of today, operating over a ruling grade of 0.7 per cent.



		The 4-8-4 will pull	The 2-8-2 will pull	The difference is
This shows that	At 5 m.p.h.	3275 tons	2825 tons	450 tons
	At 20 "	2850 "	1850 "	1000 "
	At 25 "	2475 "	1450 "	1025 "

As compared with the 2-8-2, the 4-8-4 handles 16 per cent greater tonnage at 5 miles per hour, *but at 25 miles per hour the increase is 70 per cent.*

Utilizing these two locomotives in handling the actual tonnage moving over a 230-mile division with a ruling grade of 0.7 per cent, the results are:

Type of Locomotive	No. of locomotives required	No. of trains per month in each direction schedule 25 m.p.h.	Annual cost of operation	Cost per 1000 gross ton miles	Operating saving, first year
2-8-2	45	405	$1,805,905	62.4c	
4-8-4	29	263	$1,266,884	43.8c	$539,021

It takes Modern Locomotives to make money these days!

THE BALDWIN LOCOMOTIVE WORKS 1831 1931

THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA

"CATERPILLAR'S"

BEST JOB

Prices — f. o. b. Peoria, Illinois

TEN . . . $1100 TWENTY . $1900
FIFTEEN $1450 THIRTY . $2375
SIXTY . . $4175

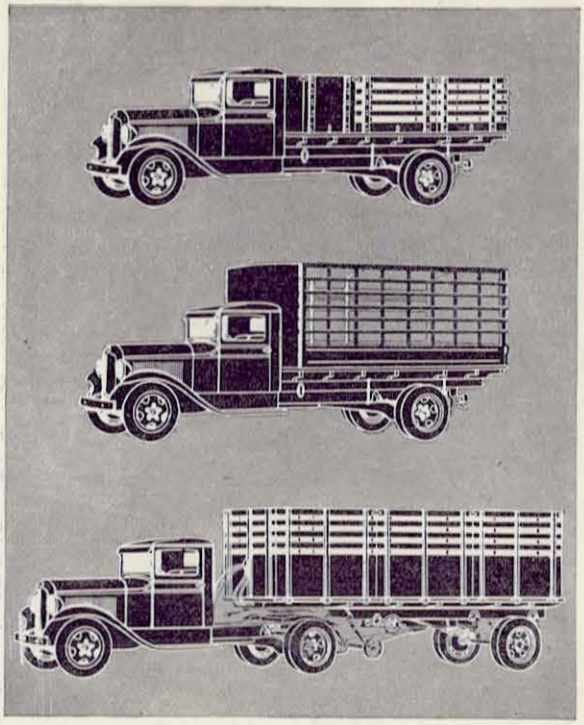
Caterpillar Tractor Co.
PEORIA, ILLINOIS, U. S. A.
Track-type Tractors Road Machinery
Combines

(There's a "Caterpillar" Dealer Near You)

MOVING earth from the wrong place to the right one — "Caterpillar" Tractors supply the power and traction at the lowest cost. To be sure, they spot cars, haul supplies, pull ties, plow snow and do a score of other chores — but earth-moving is always a "Caterpillar" job. Sometimes they smooth ballast, clean ditches — in the picture a "Caterpillar" Ten and La Plant-Choate bulldozer level ground for new switches at the stock yards in Denver.

CATERPILLAR
REG. U. S. PAT. OFF.
TRACTOR

Biggest, Strongest, Longest Lasting truck in the lowest price class



Comparative specifications prove the new SPEED WAGON is bigger, has stronger parts, more bearings, better lubrication and finer materials, proving in advance its longer life! As a matter of record, no other truck costing up to *double* the SPEED WAGON price has equal specifications!

Reo-made bodies, suiting the haulage requirements of the Railway Industry, are engineered to the chassis, matched and mounted at the Reo factory. For further information call your Reo dealer, or write

REO MOTOR CAR COMPANY · LANSING · TORONTO

THE NEW 1½ TON

REO SPEED WAGON $625

Four-cylinder $625, Six-cylinder $725
Chassis f. o. b. Lansing, Michigan
Dual Wheels $25 Extra

1. Heavy full floating rear axle designed for dualing.

2. Dual wheel equipment at slight extra cost.

3. Heavy 7" channeled frame.

4. 4-speeds forward transmission.

5. Big truck engines—4 or 6 cylinder.

6. Chrome nickel cylinders—wearing 7 times longer than grey iron.

7. Maximum piston displacements—205 inches in the 4 cylinder, 214.7 inches in the 6-cylinder.

8. Heavy steering spindles.

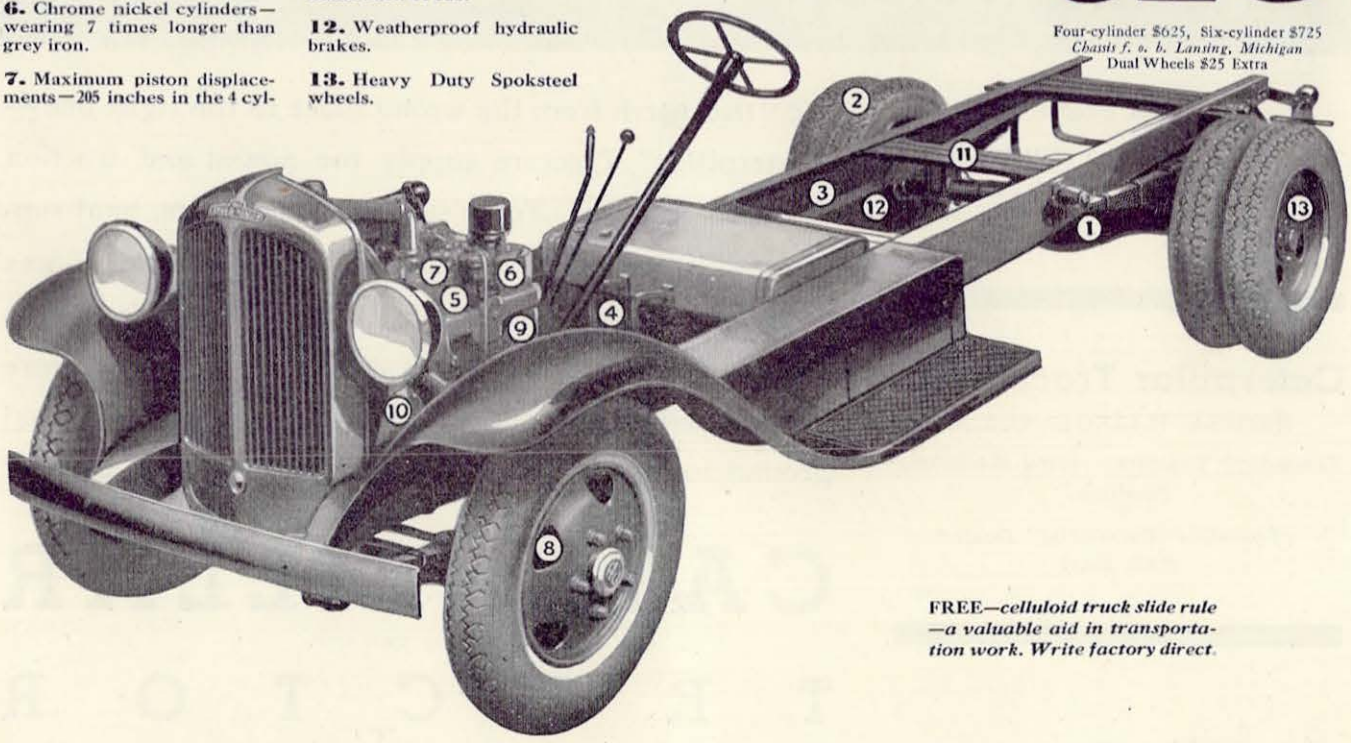
9. Full pressure lubrication—even to piston pins.

10. *Five* bearing crankshaft in the 4 cylinder; *Seven* bearing in the 6 cylinder.

11. More loading space on frame back of cab.

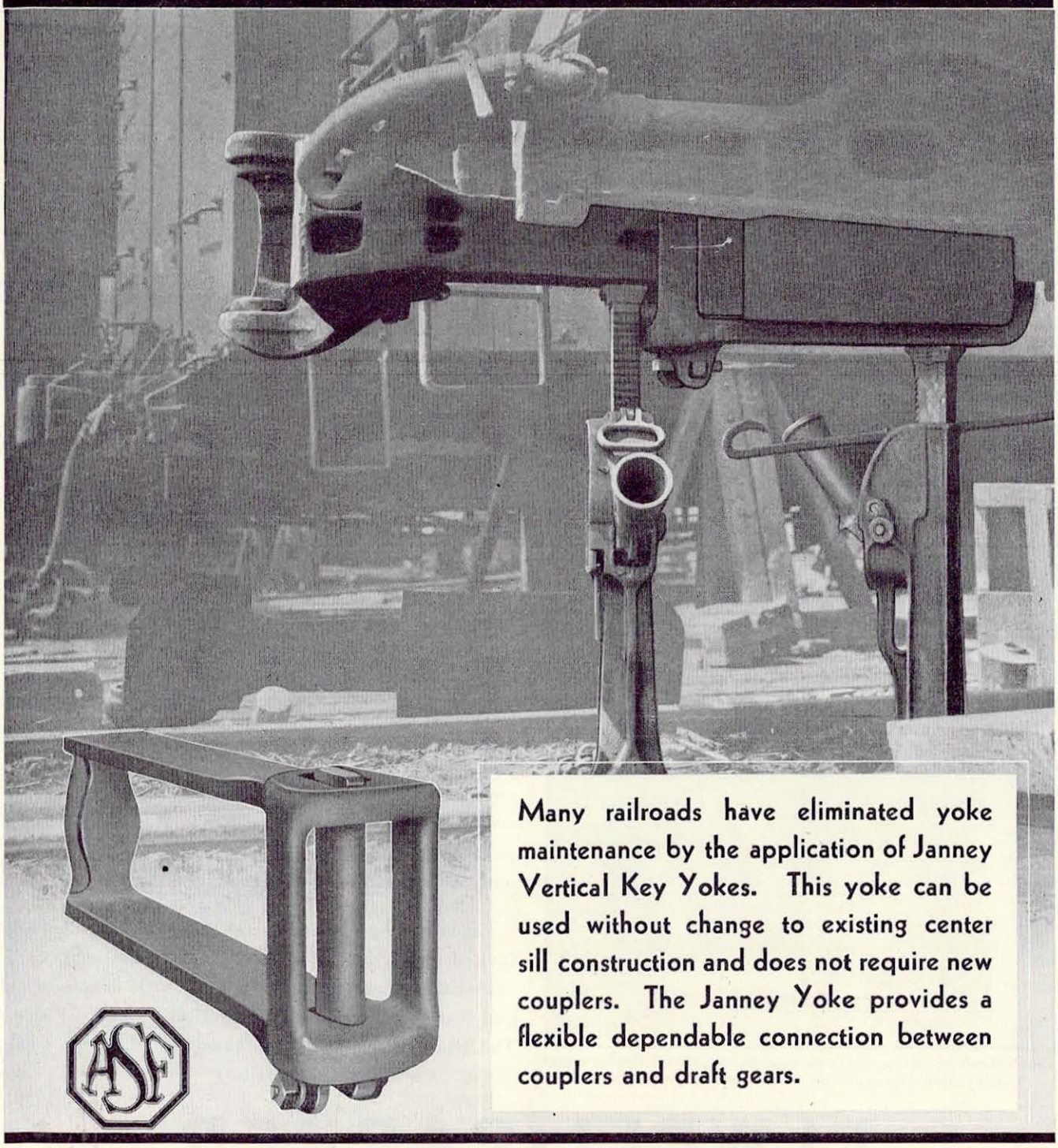
12. Weatherproof hydraulic brakes.

13. Heavy Duty Spoksteel wheels.



FREE—*celluloid truck slide rule—a valuable aid in transportation work. Write factory direct.*

Eliminate YOKE MAINTENANCE



Many railroads have eliminated yoke maintenance by the application of Janney Vertical Key Yokes. This yoke can be used without change to existing center sill construction and does not require new couplers. The Janney Yoke provides a flexible dependable connection between couplers and draft gears.

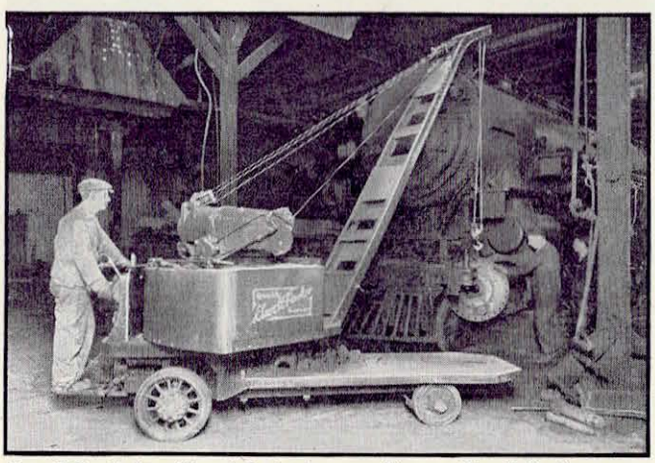
AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

Motorized methods with Elwell-Parkers Reduce Costs *in* Railroad Handling Operations

An Elwell-Parker handles ten times the load at three times the speed in freight handling.

Delivering a load of stores from track level, so that second man can place in end of car.



For difficult handling jobs in the roundhouse, Elwell-Parker crane trucks permit human hands to become merely the guides.

THE mechanical divisions of many railroads long ago appreciated the savings and safety of Elwell-Parker motorized methods of handling. Countless tough jobs in roundhouse and repair shop become easy tasks with these sturdy electrics. The ability of Elwell-Parkers to travel any runway—inside or outdoors—gives them an instant usefulness anywhere.

Stores departments, supplying the mechanical end, soon demanded Elwell-Parkers to ease their handling problems. Today, the in-and-out movement of stores with Elwell-Parkers on many a railroad has become standard practice.

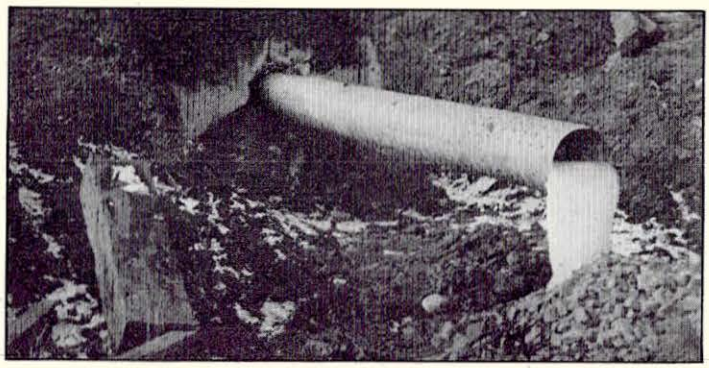
And now—with greater handling problems than ever—with the imperative need to use every cost cutting method available at no sacrifice in service, *freight* departments find their handling problems no different than those of mechanical or stores divisions. *Handling* is *handling*—everywhere. *Motorized* handling with Elwell-Parkers puts speed and economy into every movement of goods, both revenue freight as well as supplies for the road.

Executives responsible for the movement of freight are invited to ask for an Elwell-Parker Field Engineer to survey their operations. He'll show, with definite facts and figures, how motorized handling cuts costs. Write The Elwell-Parker Electric Company, 4250 St. Clair Avenue, Cleveland, for details.

ELWELL-PARKER

DESIGNERS AND BUILDERS OF ELECTRIC INDUSTRIAL TRUCKS, TRACTORS AND CRANES FOR OVER A QUARTER CENTURY

ARMCO *Perforated* PIPE



Tapping water pockets under this railroad track near Ridgeway, Ohio, with Armco Perforated Pipe helped reduce maintenance costs.

Assures Adequate Subdrainage at Reduced Maintenance Costs

KEEP costs down and yet provide adequate subdrainage—this is the job that Armco Perforated Iron Pipe is doing for the railroads, country-wide. Maintenance men have found this Armco product the most efficient, the most dependable they can install.

Armco Perforated Pipe brings many benefits. It does away with water pockets, prevents disastrous heaving, decreases mechanical wear of the ties, eliminates rail creepage and wave action—and above all, its use helps to reduce maintenance costs to a minimum.

Armco Perforated Pipe has had a splendid durability record in subdrainage service. For safety, economy, efficiency, this pipe has no equal.

Factual data on the use of Armco Perforated Pipe under various railroad drainage conditions will be sent on request.

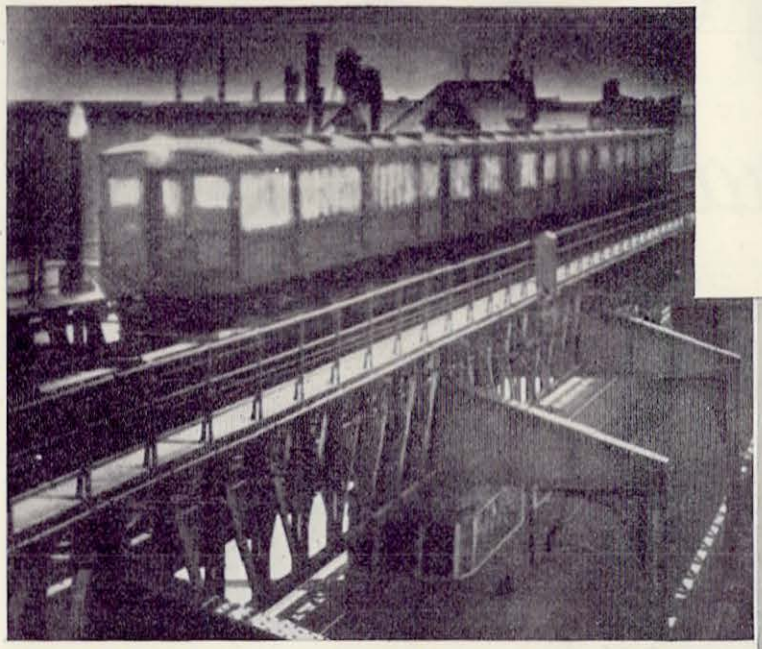
Armco Culverts and drains are manufactured from the Armco Ingot Iron of The American Rolling Mill Company and always bear its brand.

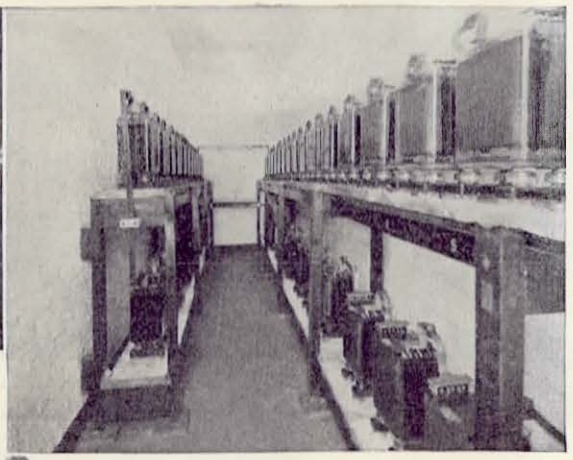
ARMCO CULVERT MANUFACTURERS ASSOCIATION

Middletown, Ohio

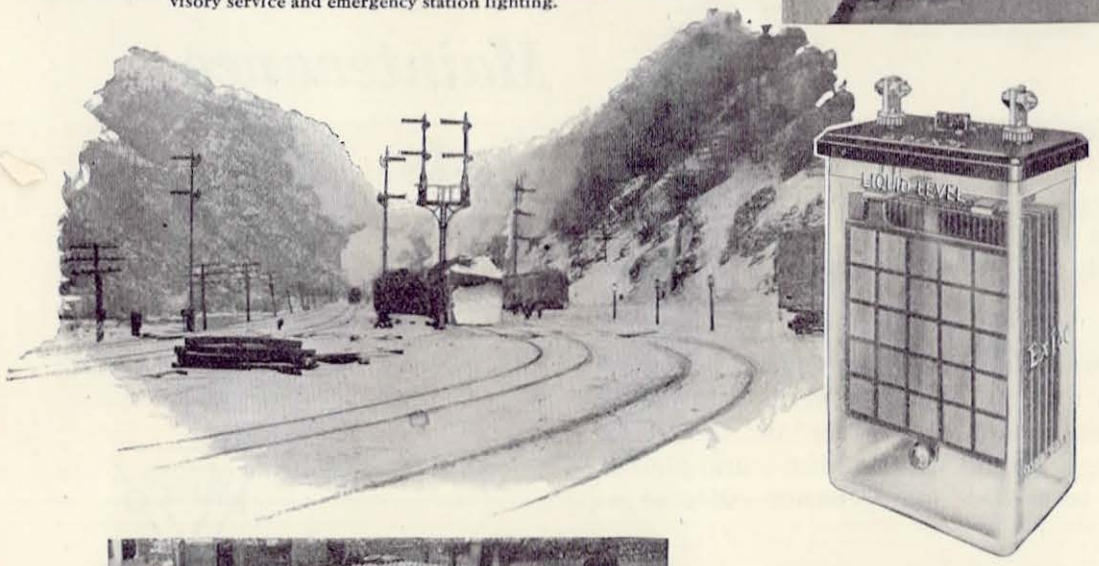
NO MATTER WHAT THE JOB

Dependably

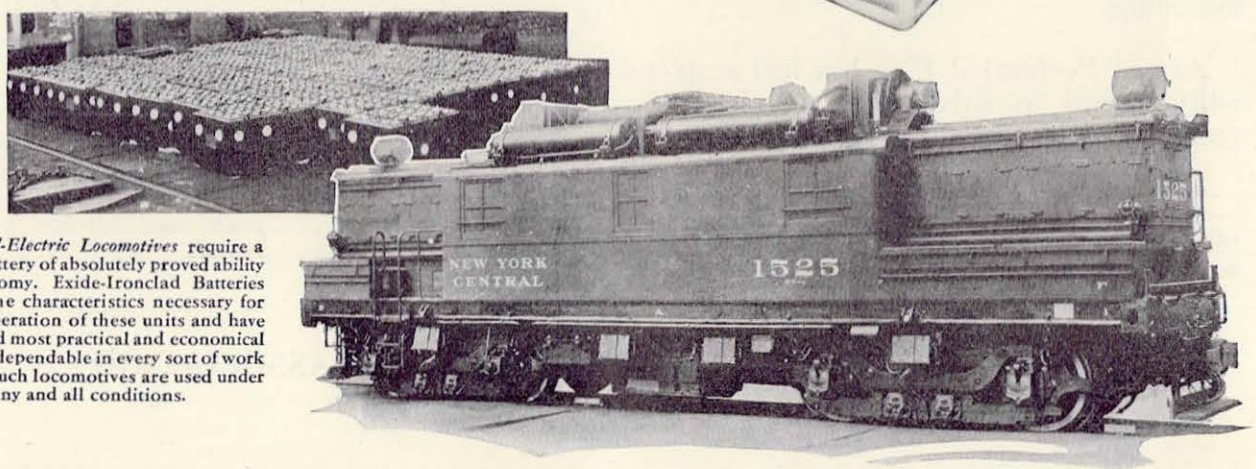




Following the lead of the great majority of power and light companies, many railroads have installed Exide Control Bus Batteries in substations. These batteries have proved to electrical engineers their outstanding qualities as units for control bus service, supervisory service and emergency station lighting.



18 *years' continuous reliable service.* That was the record of the Exide-Chloride type battery in this interlocking plant. The Exide-Chloride battery with its unique construction is the ideal battery for such service; its surprisingly long, active life brings the cost of this battery to almost an irreducible minimum. And maintenance is most simple and economical.

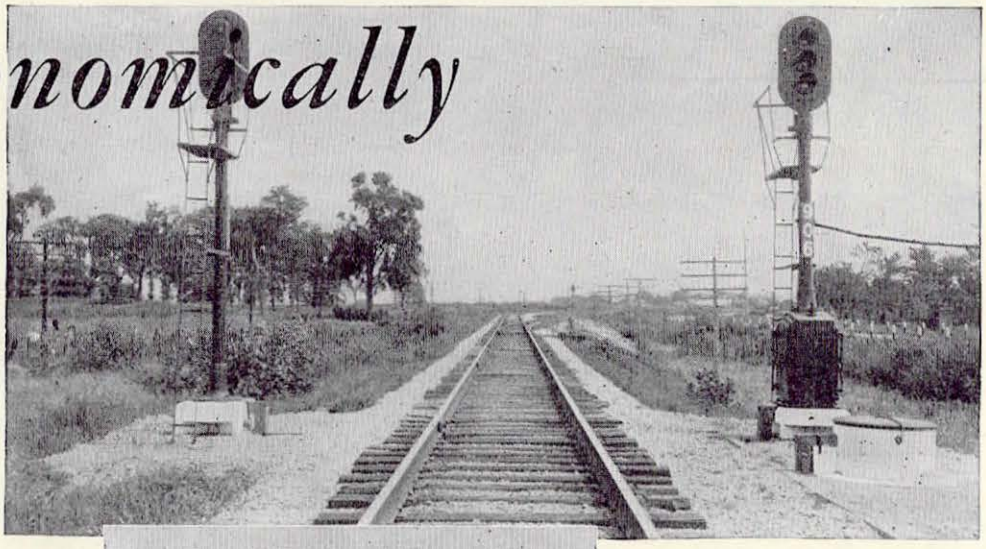


Battery-Oil-Electric Locomotives require a storage battery of absolutely proved ability and economy. Exide-Ironclad Batteries have all the characteristics necessary for correct operation of these units and have been found most practical and economical as well as dependable in every sort of work in which such locomotives are used under any and all conditions.

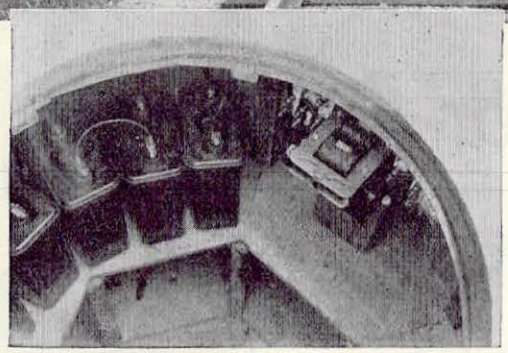
THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE

there's an Exide Battery built to do it and Economically

ON these pages you will see several uses of Exide Batteries. There are many other important applications. But lack of space prevents our going further into the subject. Let it suffice for us to say that there is an Exide for every application. And that every Exide is backed by the 43 years' experience of the world's largest manufacturers of storage batteries for every purpose.



Automatic block signals along thousands of miles of track operated by American railroads are guarded by Exide Batteries. Exides guarantee accurate, dependable operation of signals and at the same time bring down maintenance costs. And the exceptionally long life of Exide Batteries makes them a most economical purchase for railroads.



More Exide Car Lighting Batteries were purchased last year than all other makes combined. The same advantages that were the reasons for this overwhelming acceptance are present in the new Exide-Ironclad Car Lighting Battery *plus* many improvements and refinements which will be an important factor in bettering car lighting service and lowering car lighting costs.

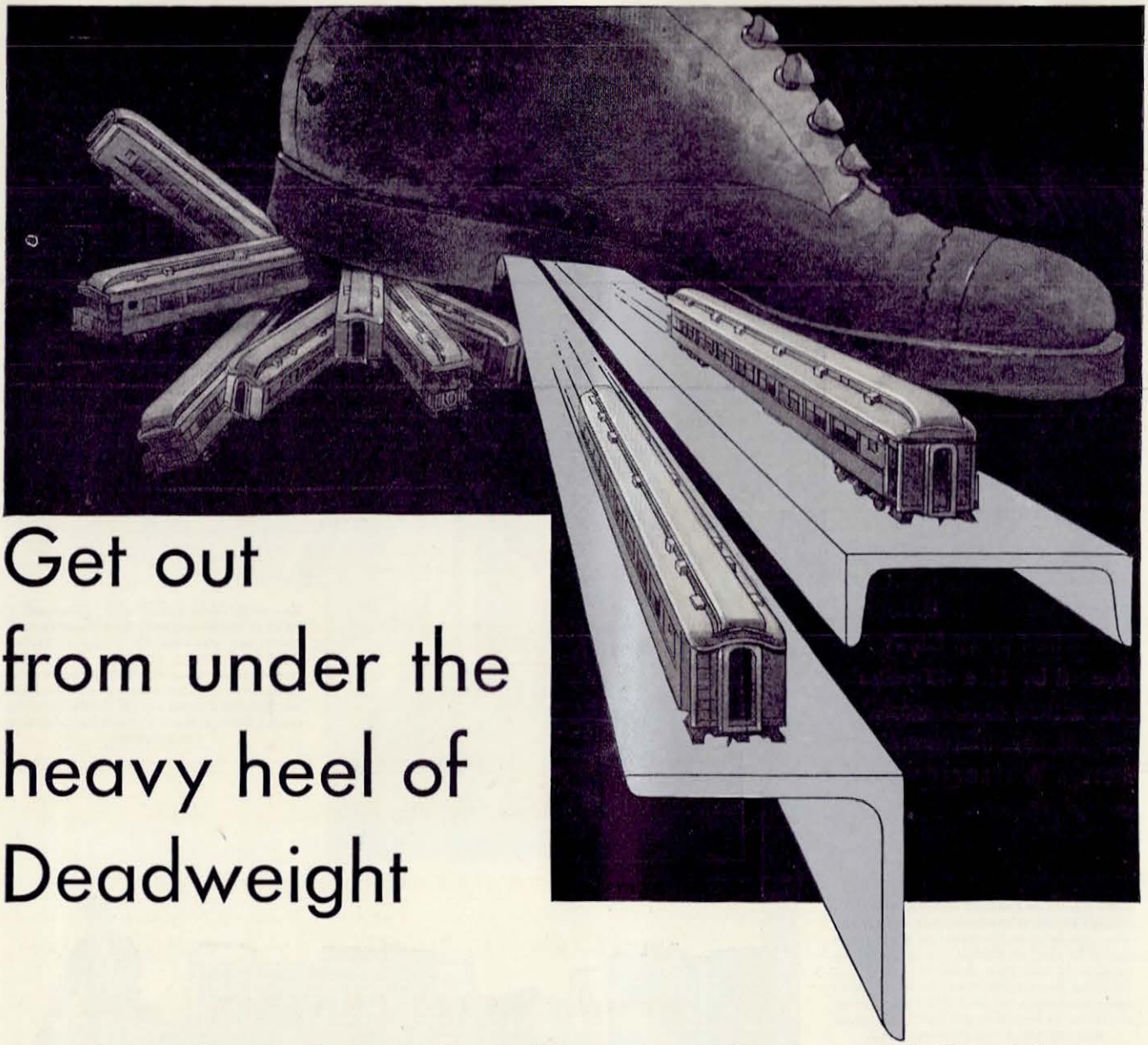
Speedy handling of baggage and freight with electrical industrial trucks depends upon the power unit. Exide-Ironclad Batteries are recommended for this service. Their stamina, efficiency, power and economy have been proved over a period of many years' service in thousands of industrial plants and railroad shops.

Exide

BATTERIES

FOR EVERY RAILROAD USE

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia *Exide Batteries of Canada, Limited, Toronto*



Get out from under the heavy heel of Deadweight

Faster, faster is the urge of progress. But dead-weight, putting its foot down, slows up schedules and grinds tracks and equipment under its heavy heel.

Escape from the burden of surplus dead-weight—"ALUMINIZE." Use the strong alloys of Alcoa Aluminum for frames, roofs, doors, side and floor members, panels, seats, conduit and fittings.

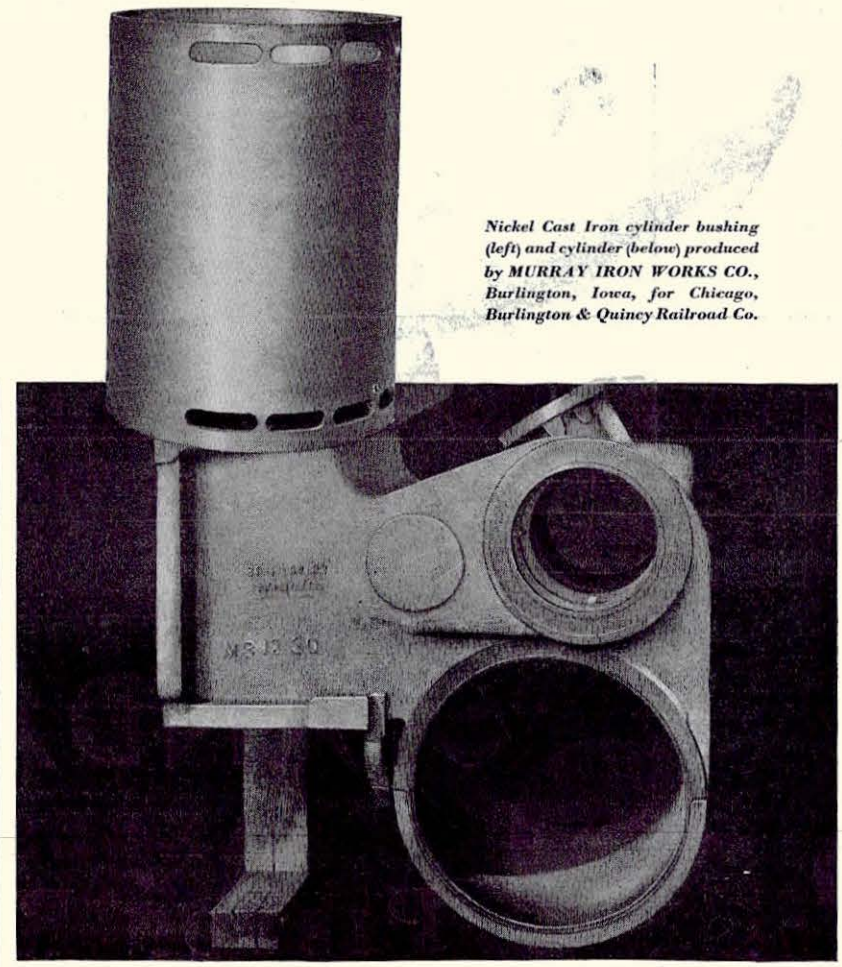
With a tensile strength of 55,000 lbs. per square inch, and weighing only 1/3 as much as old-fashioned metals, the strong alloys of Alcoa Aluminum both lighten the load and assure structural safety.

With tons of dead-weight drag removed, schedules are faster and power is saved. There is less wear and tear on brakes and tracks. This saving goes on and on, long after the aluminum has paid for itself, yes paid for itself in savings.

Standard structural shapes of the strong alloys of Alcoa Aluminum, in sizes up to 10 inches in depth and 90 feet in length, are carried in stock. These are equal to structural steel in strength, but weigh only 1/3 as much. Plates, sheet, rivets, bolts and screws are also available.

The engineering handbook, "Structural Aluminum," is available at $1.00 a copy. Address ALUMINUM COMPANY *of* AMERICA; 2478 Oliver Building, PITTSBURGH, PENNSYLVANIA.

ALCOA ALUMINUM



Nickel Cast Iron cylinder bushing (left) and cylinder (below) produced by MURRAY IRON WORKS CO., Burlington, Iowa, for Chicago, Burlington & Quincy Railroad Co.

Class 1-A *castings of Nickel Alloy Iron in* C. B. & Q. *specifications:*

Air pump bushings
Air pump cylinders (steam and air end)
Air pump pistons
Air pump valves
Crosshead gibs*
Crosshead guides and blocks*
Crosshead shoes*
Cylinder bushings
Cylinder packing rings
Passenger motor car cylinder heads
Passenger motor car cylinder sleeves
Passenger motor car elbow exhaust manifold to cylinder
Piston bull rings
Piston followers
Piston heads
Piston valve bull rings
Piston valve chamber bushings
Piston valve followers
Piston valve packing rings
All valve chamber bushings*
Slide valve bodies
Slide valve false seats
Slide valve strips
Side rod bushings*

* *When made of cast iron*

Nickel CAST IRON
A BETTER MATERIAL FOR MODERN NEEDS

Specifications for C. B. & Q. *Class* 1-A *castings read* "SHALL CONTAIN NICKEL"

NICKEL and chromium have been written into the specifications for class 1-A castings by the Chicago, Burlington and Quincy Railroad in order to obtain the following essential properties: Transverse strength...3,800 lbs.; deflection...0.110 ins.; Brinell...196 (min.) — 235 (max.)

Superheat practice in locomotives has introduced higher stresses and lubrication problems. The new conditions demand stronger and longer wearing cast iron for vital parts. These requirements are adequately met by the Nickel chromium iron castings listed at the left.

Nickel Cast Iron performs better longer in these improved railway parts just as it does in other important leading industrial fields. The result is an ever-growing recognition of the superiority of this scientifically correct material — Nickel Cast Iron.

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The continued growth in the size and power of locomotives, has made necessary great improvement in the quality of locomotive forgings. "Standard" have developed to a high degree of perfection, by careful study and research, all phases of the heating and mechanical working of ingots into forgings.

The excellent physical characteristics of forgings made under the exacting conditions employed by "Standard" — justify the painstaking methods employed and are an assurance of long life and dependability in service.

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STANDARD STEEL WORKS COMPANY

GENERAL OFFICES & WORKS: BURNHAM, PENNA.

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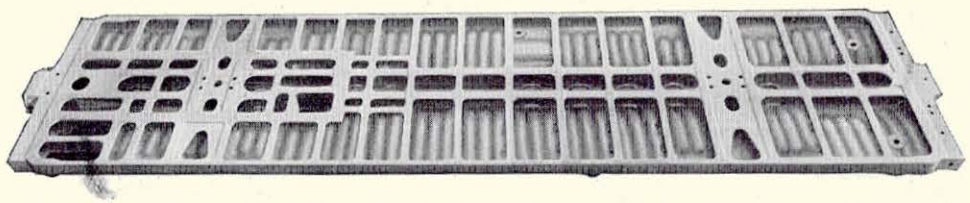
FOR MODERN LOCOMOTIVE TENDERS

Commonwealth Waterbottom Tenderframes

and

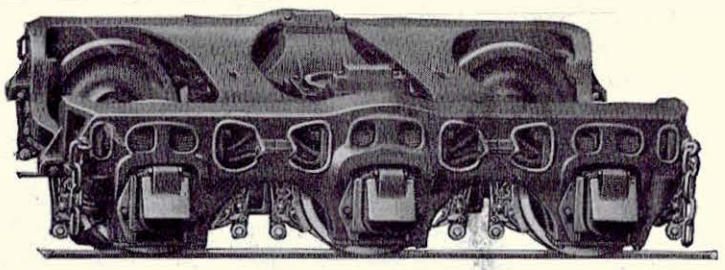
Tender Trucks

(INTEGRAL CAST STEEL PRODUCTS)



COMMONWEALTH WATERBOTTOM TENDERFRAMES INSURE:

INCREASED CAPACITY
GREATER STRENGTH
LOWER CENTER OF GRAVITY
ELIMINATION OF MAINTENANCE COST



COMMONWEALTH EQUALIZED SWING MOTION TENDER TRUCKS INSURE:

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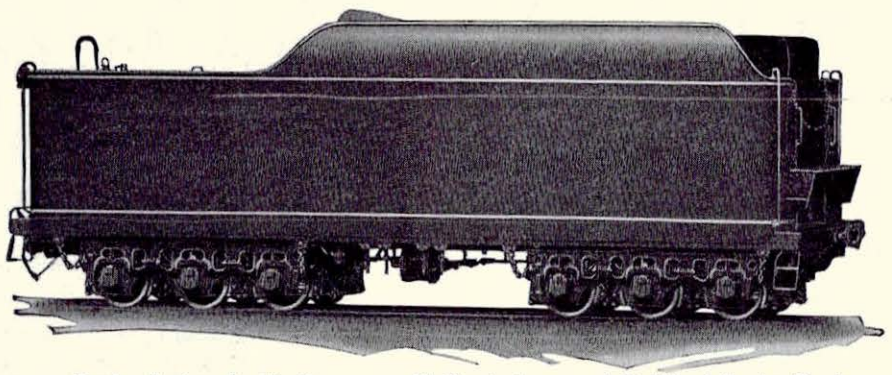
MAXIMUM STRENGTH
PREVENTION OF DERAILMENTS
LOW MAINTENANCE COSTS
ACCESSIBILITY OF BRAKE PARTS



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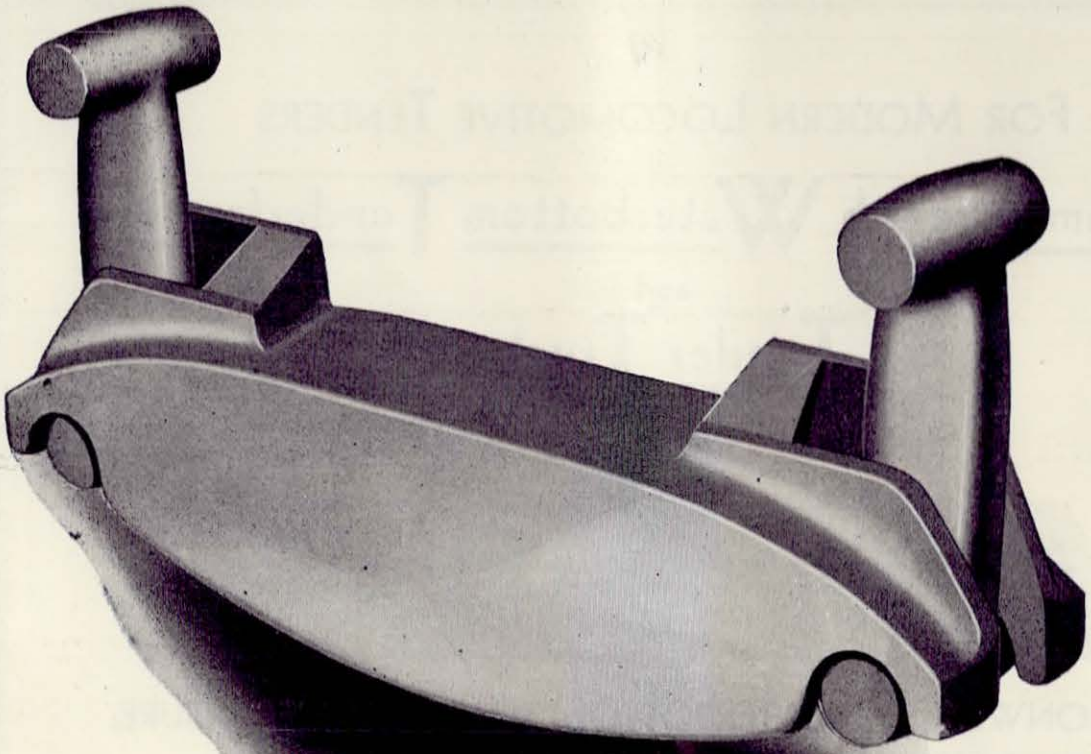

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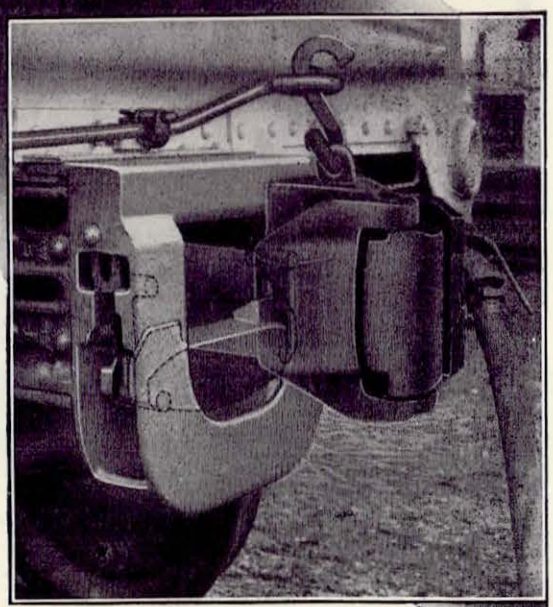
A swinging support is the fundamental merit of the Union Centering Device. It provides a frictionless carrier and keeps the coupler in its normal position.



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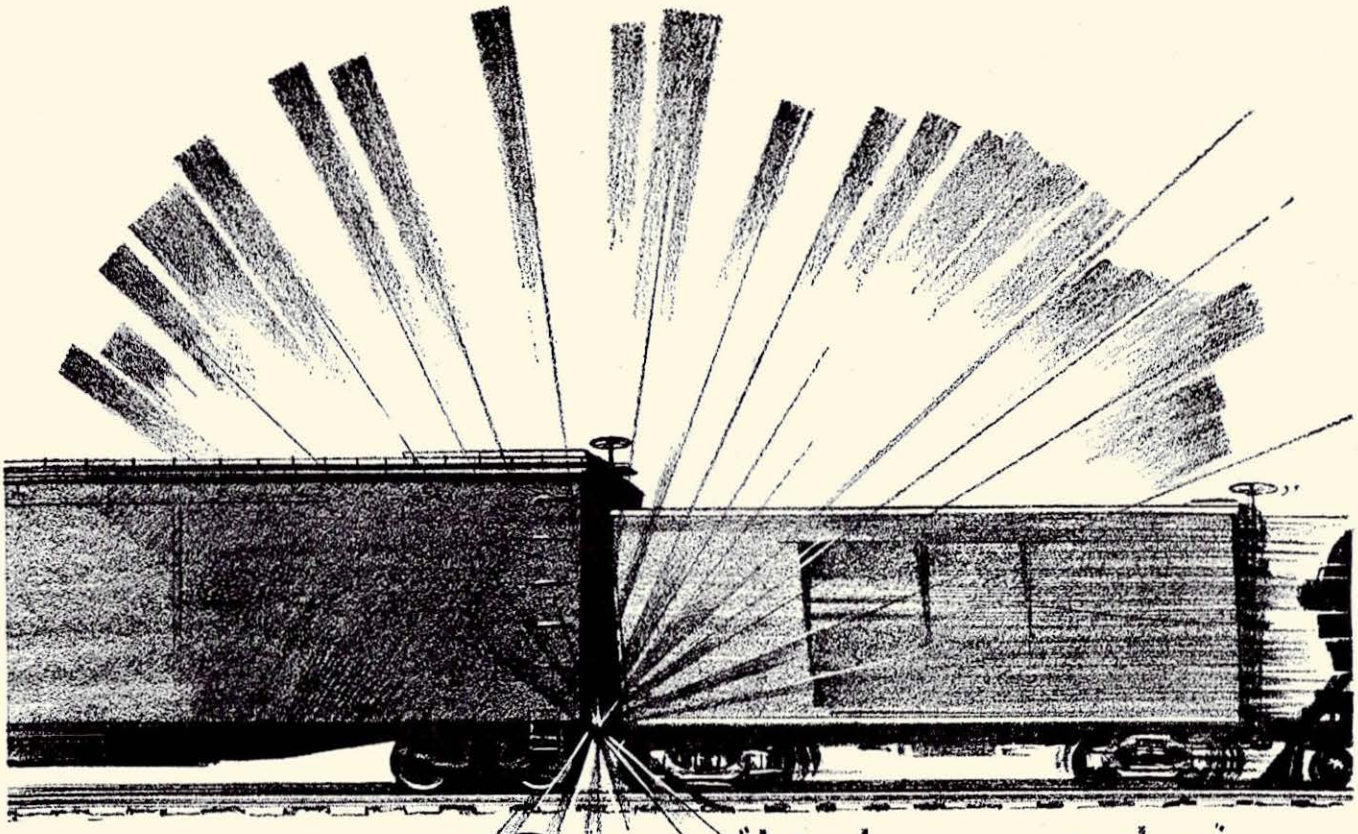

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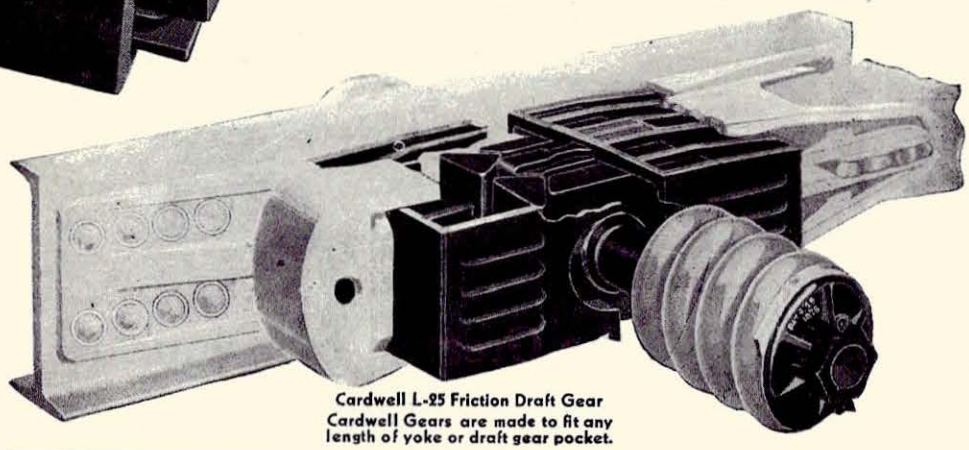

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Cost of Roof Maintenance on 30,000 Cars Equipped with

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18 Years 1913 to 1930 Inclusive-

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Average Per Year for entire 30,000 roofs—$250.00	Average for 18 Year Period per roof—15 cents

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Proves Itself the Greatest Economical Improvement in Car Construction.

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RAILWAY AGE

Opposition to the Advance in Rates

Two significant facts regarding the testimony against an advance in freight rates that has been presented to the Interstate Commerce Commission are, first, that much the greater part of it has been the testimony of traffic representatives of shippers and organizations of shippers, and, second, that it has consisted largely of warnings that this or that traffic would not bear an advance in rates and that it would result in diverting large additional amounts of freight to the trucks and waterways, especially the former.

Almost all of the testimony for an advance in rates has been given by the presidents of railroads, by the presidents of large insurance companies, savings banks, and other financial institutions, and by witnesses who have supplemented and elaborated the testimony of the heads of these great companies. They have emphasized that an increase in railway revenues is needed to meet a national emergency and solve a national problem—that if it is not secured numerous railroads are likely to become bankrupt, many more will have their credit destroyed because of their bonds being made ineligible as legal investments for large financial institutions, and the stability of these financial institutions themselves will be imperiled.

A Question, Not of Rates, But of National Welfare

This raises a broad question affecting the welfare of the nation, and, incidentally, the welfare of all classes of business concerns and the people. It is no answer to this broad question for the traffic manager of a shipper or a shippers' organization to say that the traffic of those he represents would not bear an advance in rates. The only way in which to answer directly the contentions of the proponents of an advance in rates is to try to show that an advance in rates would do the nation more harm than would failure to advance them. It may be true, as is claimed, that an advance in rates would do harm to some industries, but it is certain that failure to advance them would do harm to the railroad industry; and the question as to the choice that should be made, in the interest of the nation, between these two evils, should be answered by leaders of business and of economic thought, who take into consideration all the influences that determine general business and the national welfare, and not merely by professional industrial traffic managers whose specialization on traffic matters tends to make them give greatly exaggerated importance to the level of rates as compared with other factors affecting business.

The contention that an advance in rates will divert so much traffic from the railways to the trucks and inland waterways that it will not do the railways much good is easily answered. The railways would derive increased revenue from all but a comparatively small part of the freight now moving by rail, because, in spite of higher rates, most freight owing to economic or geographical considerations, would have to continue to move by rail and because, even in the absence of these economic and geographical considerations, other carriers have not enough capacity to handle it. Furthermore, it cannot be reasonably assumed that if a general advance in rates were put into effect the railways would refrain from making downward readjustments where they were desirable to meet competition.

Saving Rates By Increasing Taxes

The glibness with which it is predicted that an advance in railway rates would cause increased use of other carriers does, however, forcibly illustrate how much ignorance there is of the economic influences that determine the national welfare, or how some of the most important of these influences are disregarded by persons who should not be ignorant of them. The total cost of transportation in this country is paid by the public partly in rates and partly in taxes. The cost of transportation by rail is paid entirely in rates. The cost of transportation by highways and inland waterways is paid in both rates and taxes; and the more traffic is diverted from the railways to the highways and inland waterways the larger will be the part of the nation's total transportation bill that will be paid in taxes.

Even after a 15 per cent advance in rates, the average amount that the public would pay the railways in rates for moving a ton one mile undoubtedly would be much less than the average amount it would pay in freight rates and taxes combined for having a ton of freight hauled one mile either by highway or inland waterway. The total tax bill of the nation

already is about three times as large as its total railway freight bill, and it is rapidly increasing. Each shipper and each consumer is directly and indirectly paying approximately his share of the nation's tax bill as certainly as he is directly or indirectly paying approximately his share of the total freight rates collected. Just how, then, are shippers and the general public going to be benefited by a diversion of traffic from the railways which will reduce the amount they will have to pay to the railways, but which will increase still more the total amount in freight rates and taxes combined that they will have to pay for transportation by other carriers?

It is hardly to be expected that the traffic managers of shippers and organizations of shippers will give as much consideration to taxes as to freight rates, because it is their special function to deal with freight rates and not with taxes. But how can heads of large business concerns and leaders of farm organizations permit their traffic representatives to oppose an advance in railway rates with the argument that it will divert traffic to government-subsidized means of transportation, and give no consideration whatever to the fact that if the argument is well-founded it forecasts an increase in total taxes?

Freight Rates, Taxes and Unemployment

The unintelligent attitude of many persons toward freight rates and taxes is illustrated in another way. The state and national governments at present are making large, and are being urged to make even larger, expenditures upon highways, waterways and other public improvements upon the ground that they will reduce unemployment. Little public opposition to these expenditures is being expressed, although of course they will increase taxes. Why should anyone who does not oppose, or actually favors, this policy as a means of giving employment oppose an advance in freight rates? Some railways would need all the resulting increase in revenues to meet their fixed charges. Some would need only part of it for this purpose, and would use the rest to employ more labor and buy more materials and supplies; and the manufacturers from whom they made additional purchases would also increase their employment of labor. A third, although small, class of railways that are still earning their fixed charges and part or all of their dividends would use most or all of the increased revenues to employ more labor, and to make larger purchases from manufacturers who would employ more labor. How can anybody who believes it is in the public interest to increase taxes to enable the state and national governments to give more employment, believe it would not be in the public interest to increase railway rates and revenues to enable railways and manufacturers to give more employment? It is questionable as to whether some or most of the public works upon which billions of dollars are being spent this year, with a corresponding effect upon taxes, are now needed by the public; but there is no question whatever as to the need of the public for good railway service, or as to the need of the railways for an increase in their revenues to enable them to maintain such service.

Obviously, the argument for an advance in railway rates to protect railroad credit, enable the railways to maintain their properties and service, and also directly and indirectly increase employment, is much stronger than the argument for huge expenditures of taxes upon public works to give increased employment. That shippers and organizations of shippers, including farmers and business men, will have their traffic representatives appear in opposition to advances in railway rates while at the same time doing little or nothing to reduce taxes or prevent increases of them is a striking illustration of the shortcomings in the management of our business affairs as well as our government affairs which have destroyed our national prosperity and are making it so difficult to restore it.

Crowding the Highways

The statement is frequently made by those speaking for motor vehicle interests that the number of commercial motor vehicles operating over the highways is small in comparison with the number of private automobiles so operated. This is supposed to prove that the commercial vehicles do not constitute an excessive burden upon the highways. From the same source we frequently hear that the railways should not be greatly concerned by the competition of motor trucks for freight traffic, for the reason that the volume of traffic taken from the railways by their highway competitors is too small to be important.

The validity of these contentions appears to be questioned by the result of a traffic survey recently made in Ohio. In this survey, a check was made of the number of commercial vehicles operated over route No. 20, which is a portion of the through route from Cleveland, Norwalk, Fremont and Toledo to Chicago. This survey showed that an average of 22.6 trucks, tractors, trailers, and semi-trailers pass over this highway each hour, or an average of one every three minutes. The average tonnage carried in these vehicles was found to be 85.94 tons per hour. On the basis of 26.7 tons per freight car, the average load per freight car in 1930, this tonnage amounts to 3.2 freight car carloads per hour, or 76.8 freight carloads per day, which would seem to dispose of the argument that the traffic now being carried by motor truck is nothing for the railways to worry about.

Overcrowding of the public highways by the rapidly increasing number of commercial motor vehicles using them is becoming, if it has not already become, a national problem. High-pressure stimulation of the growth of our highway system has not kept pace with the high-pressure stimulation of the market for commercial motor vehicles, with the result that over-

crowding of the highways, already a serious problem in many localities, is steadily becoming more dangerous. Rigid regulation of commercial vehicles operating on the public highways, so far successfully avoided as a result of the opposition by strong motor vehicle interests, is imperative. Such regulation is the only means of protection of a victimized public.

Fortunately, cognizance of the dangers inherent in the overcrowding of the highways has already been taken by state authorities. The Public Utilities Commission of Ohio, for example, based its refusal to grant a permit for interstate motor truck operation over U. S. Route No. 20 on the findings of the traffic survey referred to above. The Ohio commission also announced that it would make surveys of other heavily used highways and that, where a point of saturation is reached, will issue no additional certificate permitting the operation of buses and trucks, except in extreme cases. Reports from Pennsylvania indicate that the state commissioner of vehicles has declared war on "truck trains" of illegal size.

These are straws that show which way the wind is blowing. Signs of the development of an aroused public opinion were in evidence earlier this year, when a number of state legislatures enacted laws which put a firm curb upon the sizes and weights of motor vehicles. There will yet be general recognition of the fact that the highways, constructed and maintained by the public, exist for the benefit of the public and not for the profit of commercial vehicle manufacturers, commercial vehicle operators and commercial vehicle users.

Fire Protection Pays

Skeptics in the railroad field who would count pennies in the provision of fireproof construction and thorough fire protection in such buildings as warehouses, freight terminals and other facilities for the storage of freight and general merchandise, might well look to the Lackawanna Terminal Warehouses, Inc., and its new eight-story warehouse and freight terminal built by the Delaware, Lackawanna & Western in Hoboken, N. J., for an example of real fireproof construction and protection, and an equally good example of the possibilities in the way of low insurance rates as a result of such construction and protection. Recently, as a direct result of a surprise fire test conducted i nthe warehouse by the fire underwriters, the local Schedule Rating Bureau, insurance representatives and local fire department officers, an insurance rate of 6 cents per $100 value of the building per annum was cut to 3 cents, and a rate of 8 cents per $100 of goods valuation per annum was reduced to 6 cents. It is said that the latter rate is the lowest quoted for general warehouse insurance in the entire Port of New York, where the prevailing rates for such insurance, with few exceptions in the cases of some of the more modern freight houses and warehouses, range from about 18 cents to as high as 70 cents per $100 per annum.

The new warehouse, which is typical of Lackawanna construction, was described in the *Railway Age* for April 5, 1930. The building which is eight stories high and has approximately 1,240,000 sq. ft. of floor area, is of reinforced concrete construction throughout, and is equipped with what is considered to be one of the most up-to-date fire protection systems in the country. This system includes a dry pipe sprinkler system, which, with 14,170 sprinkler heads, is fed by 56 six-inch dry valves; an automatic fire alarm system with 99 indication units, which detects fires long before they become intensive enough to fuse sprinkler heads; 3 large-capacity high-pressure fire pumps; 77 fire alarm boxes; 27 forty-gallon chemical engines mounted on two-wheel trucks; 243 liquid hand fire extinguishers; a similar number of 40-gal. fire bucket tanks, each equipped with six pails; 114 fire hose valves, each with 100 ft. of 2½-in. hose and a nozzle; and 27 one-gallon carbon tetra-chloride extinguishers for fighting electrical fires. In addition, employees at the warehouse have been organized into a highly efficient fire fighting organization which functions with the greatest of speed and precision on every sound of the fire gongs.

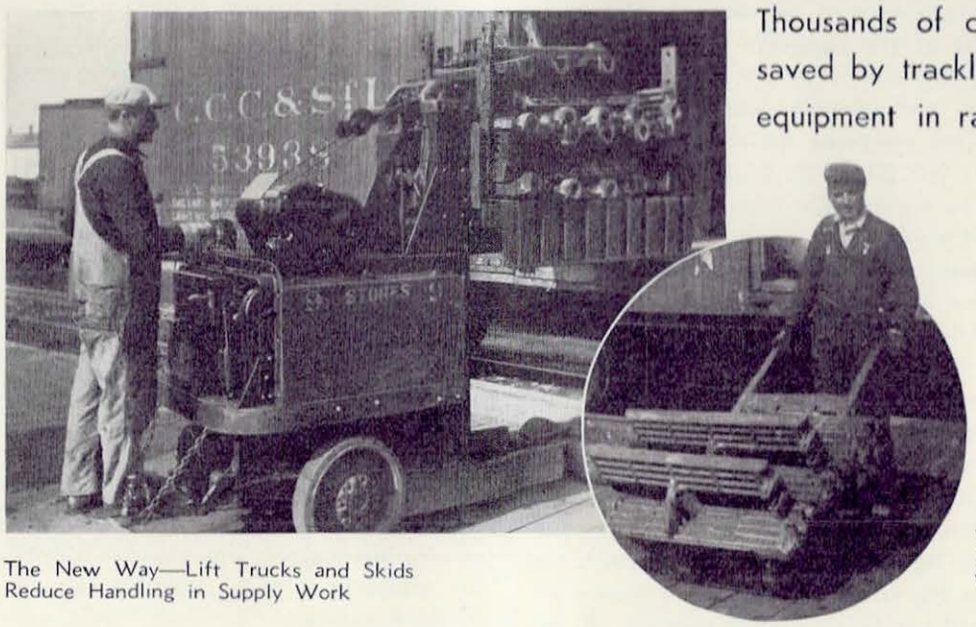
In the surprise fire test, an alcohol fire was started on the fourth floor. Forty-one seconds after the match was applied, the entire fire-alarm system went into play, and in less than two minutes 27 fire brigade employees were at the fire with water hose lines stretched and with chemical engines and hand fire extinguishers in position. If the test fire had been a spontaneous blaze, the fire damage would have been negligible and water damage cut to a minimum since the fire was detected and surrounded by firemen before the sprinkler system went into play.

That the fireproof construction and the extra protection embodied in the Lackawanna warehouse are desirable and economical from the standpoint of both the railroad and the users of the warehouse, is shown by the fact that the possibility of a serious fire is so remote that no insurance is carried on the building proper, and by the further fact that large savings are made in premium payments through the extremely low rate on the goods insurance. On the basis of a valuation of $5,000,000 on the warehouse itself, there is a saving of approximately $1,500 annually on insurance, even if the low rate offered of 3 cents per hundred is considered. On the basis of operating the warehouse at only two-thirds capacity, with an average commodity valuation of $10,000,000, the saving to the warehouse customers between a rate of six cents and one of 30 amounts to $24,1000 per annum.

With these savings being made primarily as a result of the added fire protection equipment provided, which involved an additional investment in the neighborhood of $50,000, no detailed explanation should be necessary to convince one of the value of the construction and fire protection systems installed.

Railroads Wise Will Motorize

Thousands of dollars to be saved by trackless handling equipment in railway work



The New Way—Lift Trucks and Skids Reduce Handling in Supply Work

The Old Way

IN the industrial tractor, lift truck, crane truck and highway truck, and other trackless power units for handling materials, the railways have useful and effective equipment with which to reduce costs. Material-handling costs, freight-handling costs, rail-transportation costs and the cost of doing maintenance and construction work are all vulnerable to this equipment. The possibilities of motorized methods on railways are more often underestimated than overestimated. Because of its strength, speed and flexibility, such equipment is revolutionizing railway storehouse, repair-shop and also freight-house practice in the same way that it has revolutionized factory practice. It puts manual methods of handling material on the defensive and forces the warehouse truck and wheelbarrow, as well as the rail push car, into the past as surely as the automobile has pushed the horse off the highway. The equipment is part and parcel of a new and better way of moving materials. Line forces, as well as those in terminals, can find in them better and cheaper ways of doing their work. Railroads have seen what motorized conveyors can do against them, but are only beginning to see what motorized methods can do for them. Payroll savings in the first year sufficient to offset the purchase price can often be effected with this equipment.

Equipment for Every Need

Motorized equipment is available to the railroads in types and sizes adapted to almost every conceivable railway problem. There are tractors equipped only to pull; others have boxes for loads; still others are equipped with large wheels for high speed, or with crawler treads for rough ground; some are equipped with bumpers for pushing; while scores of different accessories are manufactured for special uses, including especially the various crane attachments for hoisting and lifting, and power brooms and plows for cleaning roads or moving earth. The trailers also vary widely in types and sizes. Dump wagons, demountable bodies, oil tanks and other special equipment are included, as well as standard wagons for hauling ordinary types of material. Some lift trucks are built only to raise the load from the floor; others elevate the load six feet or more for stacking purposes; while still other machines are equipped with forks and tilting arrangements for moving bulky commodities piece by piece. The crane trucks range from the electric machines with a long boom having a low base to those equipped with a short boom having a high base, while the motorized handling equipment includes also low-wheeled and high-wheeled powered warehouse trucks, ranging from the ordinary platform vehicle to those especially adapted to handle baggage. These variations suggest the possibilities of motorized equipment in railway work, but the significance of motorized methods appears especially from the fact that all these machines are trackless movers, while the larger machines are adapted to develop 20 hp. at the drawbar, to lift from one to ten tons and to travel at speeds up to 15 m.p.h. Inclines are not impediments to this equipment and the large-type tractors stop at scarcely anything short of impassable ground.

Motorized Methods in Stores Work

In supply work, the equipment produces a saving by doing work with less men or in less time, or both. Committees of supply forces have found that it is adapted to handle 75 per cent of all the materials. Instead of unloading cars by carrying or hand-trucking the materials piece by piece to the storehouse or storage platform, the material can be placed on the trailers and moved in one operation by a tractor operator, and cars can be loaded in the same way. The men can remain at work in the cars, and the tractor does all the trucking. Instead of moving in hand-truck loads,

the material moves by the trailer train-load to destination. Under properly co-ordinated operation, the tractor, after hauling the material to destination, can pick up outgoing material by the trailer-load on its return trip and place the trailers for loading into cars. Materials can be moved by the trailer train-load quickly and with little expense from the storehouse for long distances and often over uneven surfaces to roundhouses, machine shops, car-repair tracks or other storage points, and vice versa. If a car needs spotting, the tractor can furnish the power. Cars can be loaded or unloaded at one time instead of being switched or reswitched about a yard. Heavy materials requiring several men to lift and move, in the absence of overhead or locomotive cranes, can be lifted and placed on the trailers, or carried to platforms or directly to other parts of a terminal, by crane trucks, which are also adapted to pile heavy articles and to load and unload cars from ground level. When the tractors are not occupied in loading and unloading cars of supplies, they are available for other work, as for example, the hauling of cinders and the repairing of roadways, building platforms, etc.

At one point on the Illinois Central where 31 cars of material, excluding scrap, are loaded and unloaded daily, tractors and trailers replaced transfer cars and push cars in the yard and saved two handlings into transfer cars and the switching of these cars, while a further saving arose from the elimination of delays in operating push cars over single tracks and turntables and in speeding operations approximately 50 per cent. At Sacramento, Cal., on the Southern Pacific, loading and unloading operations, which once required the switching of a car as many as three times and often as many days, are now done in a single day at one spotting, as a result of the improved material handling. The Central of Georgia has estimated that one of its tractors saves $1,500 a year in handling storehouse materials, while a second tractor at another point saves $2,000 a year in similar work. On the Rock Island, a single tractor effects a saving of $5,000 a year in reduced labor and switching charges. The Union Pacific estimates the saving of a tractor not equipped with accessories at $15 a day, while tractors equipped with accessories produce larger savings.

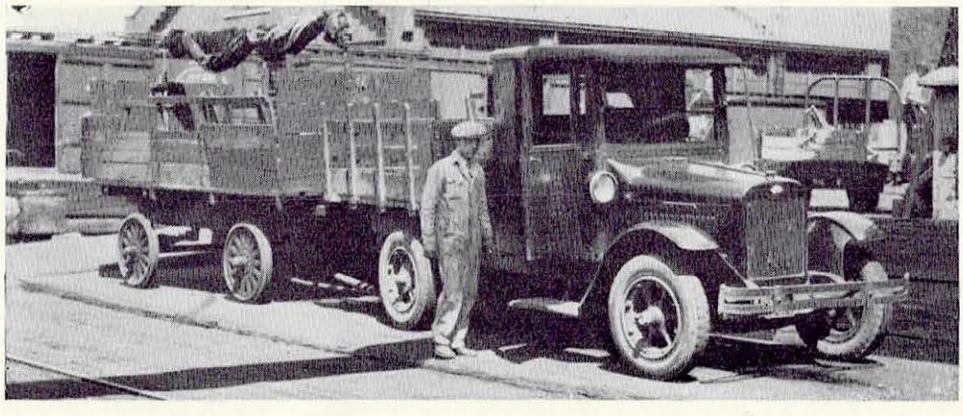
It is significant of the diversity of crane-truck operations that in the course of a trip through a storehouse of the Atchison, Topeka & Santa Fe, one crane tractor was seen moving a locomotive main rod into a box car, and another, operating from ground level, was unloading a car of axles. Still another crane truck was lifting trailers of scrap from the ground level and dumping their contents into a car, while a fourth crane truck was lifting baskets of castings off trailers and immersing them into a dipping vat. On the New Haven, two men with a tractor equipped with a snow broom do as much work in keeping the walks clear as was previously done by 20 or 30 men, and are credited with a saving of $1,500 in one winter in this work alone, while the same truck is credited with a saving of $3,000 a year in handling heavy machinery.

Lift Trucks Reduce Handling

With lift trucks all or part of the material in a car, such as brass, paper, sheet metal, brake beams, etc., can be received directly from manufacturers in portable boxes, or skids, or placed in such boxes when unloading the car, and a task which would take several man-hours to perform where the material is handled in small lots can be done in minutes by carrying the load into the store-room by lift truck where it can be stored on skids. With lift trucks the materials can be delivered direct to shops in skid loads either by lift truck or on tractor-trailers, and the skids can then be used as containers for material or the materials can be shipped on skids to points where stores forces, using another lift truck or hand lift truck, can quickly remove the load from the car. With a high lift truck, skid loads of material can be removed from a car, spotted at ground-level platforms, or elevated in the store-room or car to allow stacking the material. The economy of skid operations is increased by using the empty skid to return other material and thus save rehandling of material at destination.

On the Chicago, Milwaukee, St. Paul & Pacific, where supplies are now handled largely with lift trucks and of a total of 200 possible operations in handling brake shoes into a car in one-fourth the time it took to load 15 brake shoes with a wheelbarrow. In moving from origin to the ultimate point of use on skids, the handling of a car-load of brake shoes has been reduced from 175 manual operations to 7. On the same road, a 1,750-lb. air pump that previously required from 3 to 5 men to move is now loaded or unloaded in a minute by a single operator with a power or hand lift truck. Lift-truck operations have eliminated 190 manual out of a total of 200 possible operations in handling brake beams and do the work in a fraction of the time previously required. At least $2 is saved on every skid-load of airbrake hose handled. Once a car journal brass is loaded onto a skid at the foundry, it never touches the ground until it is used.

The Illinois Central saves $17.50 in labor charges every time a car is loaded with journal brass, while the cost of loading and storing a car of tinware on this road has been reduced from $7.58 to $2.69 by the lift-truck method. On another road, one man handling locomotive tires from cars to shops accomplishes in one hour what four men took 12 hours to do by hand. On the Missouri Pacific, where 75 per cent of the material is now shipped from main stores to line stores in lift-



Auto Trucks Pay Well in Non-Revenue Work

truck boxes, the time of unloading and storing a car of brick has been reduced from 32 man-hours to less than one man-hour, while the work of loading a car of brake beams has been reduced from 22 man-hours to one man-hour and a saving of $5 is made on every car of material loaded, without considering the other savings which result from truck operations.

Tractors Fit Scrap-Handling Work

In addition to handling new materials, railway supply forces also handle large quantities of second-hand materials and scrap iron, and are constantly required to deliver materials to roundhouses and baggage stations for making emergency shipments on trains. The economies of motorized operation are striking in these fields where tractors and trailers can reduce the number of men required to pick up materials and haul them from place to place in the reclamation plant or to the storehouse, and afford a means of making emergency shipments without disrupting organizations employed for other work. One lift truck on the Missouri Pacific made it possible to release 13 men at the time of its installation in a reclamation plant and has since increased the number of men released to 20. On the Chicago & North Western the man-power required to move couplers from a steam hammer to the furnace and then to the assembly yards is 13 to 1 in favor of the lift truck over warehouse-truck methods. It has been demonstrated that the collecting, shipping and otherwise handling of shop and maintenance-of-way scrap by a combined lift truck and tractor operation can release locomotive cranes and, under not exceptional conditions, prove more satisfactory than traveling cranes or other fixed facilities.

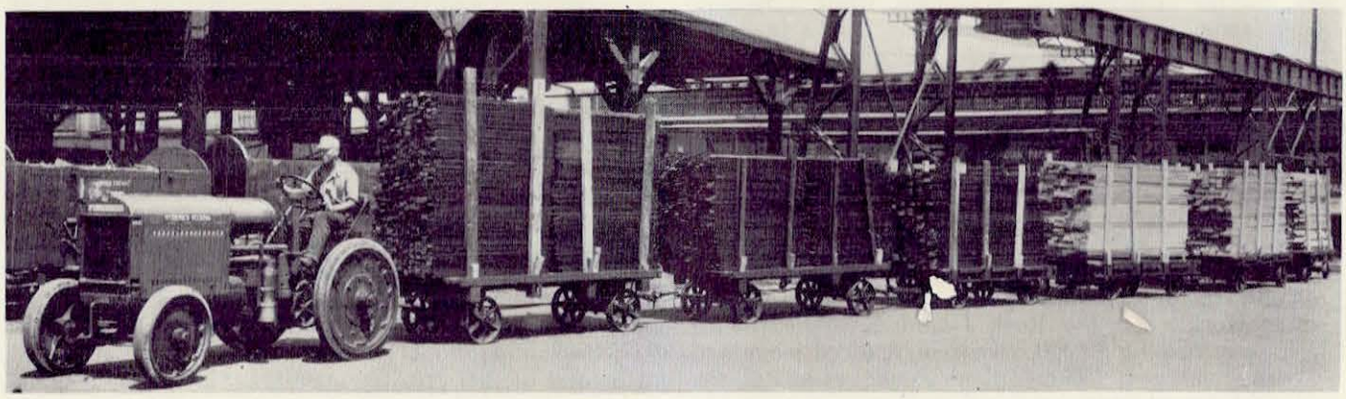
Tractors Cut Man-Hours in Shops

An analysis of railway operating expenses shows that the cost of repairs to locomotives is one of the largest items of railway expense. This expense consists of charges for labor and charges for material. Material-handling methods affect both these items of expense. In the machine shop, tractors, cranes, trucks and lift trucks can produce economies by eliminating the necessity of mechanics leaving their work to carry materials to and from stores or to move materials or locomotive parts from one shop to another. The requirements of many mechanics can be supplied at scheduled or special intervals by tractor operators working under stores department or shop supervision. In a busy shop, this arrangement profoundly influences shop output and the timing of work schedules, but it also conserves the time of workmen when the number of men is curtailed, particularly in places where it requires several men to move material without mechanical aid. On the Canadian National, the report that two tractors save $1,400 in shop delivery work alone by relieving 3,600 man-hours for shop work is a conservative picture of the savings commonly reported where much heavy material is hauled distances.

By eliminating push-car operations between shops where the tracks are likely to be blocked at intervals, tractors can also produce gratifying economy. Tractors often provide a quicker and more convenient way of moving material than fixed cranes, while crane trucks often pay for themselves in shops equipped with overhead cranes because of the greater range of movement. On one road it is estimated that tractors and trailers save the mechanical department $5,000 a year at one shop in flue handling alone.

Trackless handling equipment in shops can also produce striking economies by eliminating the repeated handling of material in moving it from machine to machine. The material can be left on either the trailers or skids and then moved by tractor or lift truck from one position to another. For this purpose, special containers are used for hot metal, and the economies are enlarged upon by equipping containers for handling also by overhead cranes.

In the same manner, with motorized systems of handling, materials or parts stripped from locomotives can be placed on trailers or skids for movement to repair points or to points of storage, thus reducing the number of times that material must be handled, as well as keeping these parts from becoming lost and the shop floor from becoming congested.



Gasoline and Electric Traction Equipment Multiply the Man Power and Reduce Switching Expense

In addition to these operations, tractors and lift trucks in shops are available for securing blocking and removing refuse and sweepings from the floors.

Trackless Power in Roundhouses

In the roundhouses, trackless power can not only pay for itself through the delivery service it provides, but the crane truck provides the mechanics with devices which can go any place in the house and furnish power to lift steam domes, headlights, front ends, main rods stokers, feedwater heaters, air pumps, springs and similar appliances, which are particularly awkward to handle in the absence of the crane facilities installed in machine shops. Claims that the crane truck is the more important mechanical development in roundhouse operation are well substantiated. Tractors and trailers can also produce economies in engine-house operation by removing dirt which rapidly accumulates in locomotive pits. On one road, a tractor saves between $500 and $600 a year in cleaning engine pits alone, while at another point, the time saved in this work has made it

possible to reduce the engine-house and labor forces from eight men to four, at a saving of $3,700 a year.

Cutting Car Maintenance

It is a fact not fully appreciated that repairs to cars represent a larger item of railway expense than repairs to locomotives. Yet car shops and car-repair yards are seldom as well equipped for mechanical handling as are the locomotive facilities. In car shops, tractors often provide a more flexible means of moving material than do fixed cranes, and, with few exceptions, they far surpass the push cars as a means of bringing material to the shop or moving it from car to car. In one large shop recently built the secondary tracks installed for handling material have never been used, while an elaborate system of secondary tracks in another shop has since been abandoned for the more economical method.

With motorized methods, lumber can be moved on trailers or skids to mills or from mills to points of use with but one handling. Other materials can be loaded on trailers in predetermined quantities and delivered to the exact point of use as they are required for a timed-car program. With lift trucks, skids loaded with bolts, journal boxes, couplers or forgings can serve as bins in the shop until the supplies are used. When a block of cars is ready to move, it is respotted by a tractor instead of a switch engine. On the car-repair track, mechanics can remain at work while a tractor operator obtains the required material. The equipment tractor is also available on call to remove car wheels, apply bolsters and car ends. Likewise, it can show economies surpassing those in the machine shops by hauling away old lumber and old scrap iron.

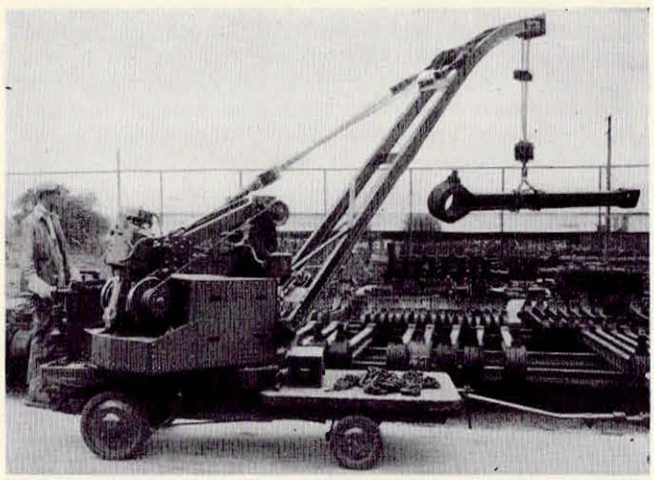
The Nashville, Chattanooga & St. Louis furnishes an example of the economies in tractor operation in this class of work in a report that one of several crane trucks effects a net saving of $1,000 yearly by handling mounted car wheels, steel center sills, bolsters and trays loaded with scrap iron. On the Chesapeake & Ohio all scrap iron from one car-repair yard is moved by trailer directly to the scrap dock where most of it is dumped into cars for market without further sorting. In the car shop on another road, scarcely any material for car building now touches the floor, being handled entirely on trailers or skids.

Reduce Accidents

In performing such work the economies of motorized methods are enlarged upon by the fact that they frequently avoid injury to material. An example of this occurs in the handling of journal bearings, wherein the lift-truck method avoids rejections by reducing the number of times the pieces are handled. More important than damage to materials is the protection afforded against injury to workmen. In almost every stage of material handling, and especially where such clumsy commodities as piston rods, springs, air pumps, locomotive stokers, rail frogs, etc., are handled, the chance of accident is present.

Motorized methods also contribute in definite, though not easily-measurable ways, by permitting stores to concentrate their supplies and thus to operate under smaller inventories, and they frequently afford the means of dispensing with the necessity of building new facilities either for the purpose of providing more storage capacity or in order to bring materials closer to points of use.

In addition to reducing the cost of materials and saving the time of mechanics in terminal areas, motorized methods can produce substantial economies by speeding up work, providing closer supervision of employment, and reducing engine delays. The economies of this equipment are enlarged upon where a co-ordinated supervision is exercised to eliminate idle time of the trackless equipment, empty movements and cross hauling, and to co-ordinate the operations with the requirements upon the service. Where this co-ordination is secured at small points, the value of trackless equipment can be greatly multiplied.



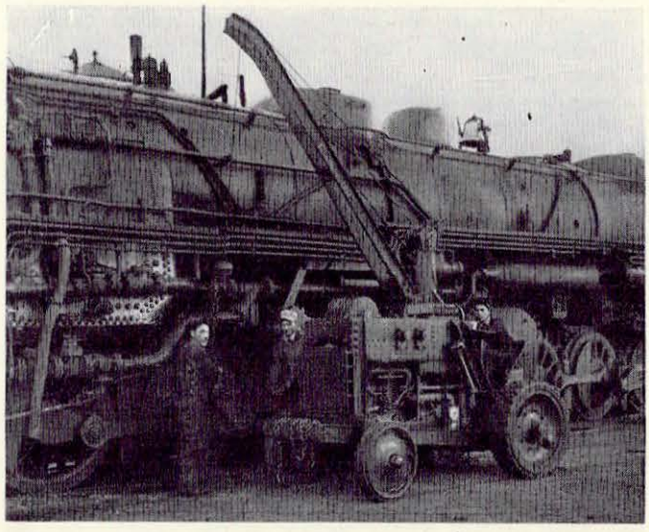
The Electric Crane Truck has a Wide Flexibility of Operation

Considering the direct and indirect economies, trackless equipment will, time after time, pay for itself in the first year's operations. The supply department of one road has credited an investment of $90,000 in tractor and lift-truck equipment with a direct pay-roll reduction alone of $81,000.

Cutting Freight Expense

The handling of merchandise in railway freight houses is an almost untouched field for economies of motorized methods. The diminishing amount of l.c.l. business is a deterrent to changes in methods, and a certain resistance to changing accustomed ways of moving materials is also a factor in the problem, as well as the complication caused by the great variety of the freight to be handled. Freight operations are too large an item of expense and freight-house methods are too intimately associated with public service to evade the march of progress, however.

The statistics of the Interstate Commerce Commission show that the item, "Station Employees," is one of the



A Variety of Combinations Are Available in Trackless Equipment

largest items of railway operating expense. A substantial portion of this expense is the cost of handling approximately 40,000,000 tons of l.c.l. freight a year. This freight is received from street vehicles and from cars. Some of it must be assembled quickly for shipment or delivery and other material must be held awaiting shippers' instructions. The freight houses vary from small depots handling a car or two a day to the great merchandise centers, piers, docks and wharves in large cities. Conditions are not alike in any two sta-

Motorized Methods are Needed in Freight Houses

tions by reason of the building layouts, the condition and age of the facilities, the amount of merchandise to be handled and the conditions under which it is handled. With the cost of operating many depots ranging from $1.00 to $2.50 per ton of freight handled when the rail-haul revenue is only a few cents per ton-mile, the freight stations are few which will not show the beneficial influence of motorized methods.

Motorized equipment offers the means of moving large volumes of this freight faster with fewer men and also avoiding the confusion of goods and resulting claims which arise from excessive handling. On the Chicago & North Western, for example, hundreds of trailers are loaded with merchandise at pick-up stations and moved bodily by highway truck or trap car to a common assembly point where the loading of the merchandise into cars for shipment is marked by a despatch that reduces costs and has much to do with the road's ability to hold this class of revenue.

Useful at Piers and Docks

Lift trucks and skids are demonstrating their value in striking ways at piers and docks where large quantities of merchandise can be piled to the full capacity of warehouses with a fraction of the labor previously required or where it can be loaded in readiness to be moved quickly to ships and the load lifted bodily by ship tackle, reducing handling and releasing equipment in a fraction of the time otherwise possible. Since the adoption of the lift-truck method of transferring freight at the Port of New York, which is equipped with 18 power lift trucks, 25 hand lift trucks and 4,000 skids, the New York Central has saved approximately 25 per cent in handling costs and has practically eliminated claims for damages on commodities. These studies covered 63,152 skid shipments, aggregating 95,000 tons, made to steamer side, and the freight handled included all kinds of merchandise.

With the increase in the quantity of merchandise that is being shipped from factories to destination on skids, the value of lift trucks grows in the freight houses, while their value is further enhanced by the increasing amount of store-door delivery undertaken by the railroads and the growth in the use of container cars. With the lift truck, merchandise can be received at the platform on skids and moved into freight houses into freight cars on the same skids, releasing labor and cars quickly and reducing the damage to lading. The lift truck also affords the means of moving containers from auto bodies or cars without the need of overhead or locomotive cranes. By expediting the movement of traffic and reducing the cost of handling to shippers, as well as to the railroad, motorized methods of freight-house operation are the essence of progress and a vital factor in solving the l.c.l. problem. Instances frequently come to light where this equipment has paid for itself in a few months by the speed and economy of its operations.

Tractors Needed by Line Forces

The obvious dependence which contractors of railway work place on trackless material-handling equipment exemplifies the economy that this equipment will produce in work of a similar kind which the roads undertake with their own forces. Hundreds of possibilities constantly arise in the construction and roadway maintenance field where caterpillar or crawler-mounted tractors, once allowed to demonstrate their value, become indispensable. Equipped with a broom or plow, they can save money and time sweeping platforms of snow. They can substantially cut the cost of filling icehouses and of distributing the ice. They are equally adapted to eliminate handling costs in building and repairing highway crossings, doing track work in city streets and handling materials for concrete and embankment work. The Burlington profitably employs caterpillar tractors in grading work. On the Great Northern, two tractors of the caterpillar type are now an indispensable part of the equipment of a telegraph and telephone force for patrolling snow-bound roads and for pole-boring and setting work. They can pay for themselves in a short time in ditch-digging and filling work and, in addition to work of this kind where tractors can be moved by road or rail from one job to another as the need arises,

In Next Week's Issue

Extended locomotive runs, with heavier trains—more efficient locomotive utilization with the attendant increase in mileage and time between shoppings—have made it necessary for many roads to modernize engine-terminal facilities to realize the full benefits of the many improvements in motive-power practice. However, some roads have permitted their terminal facilities to lag seriously behind the development of the locomotive. Many engine-terminal supervisors are fighting a losing battle in striving to keep modern power on the road with antiquated equipment. Modern terminals not only save money in the actual work of preparing and making running repairs to locomotives, and in the operation of terminals, but also afford the roads a splendid opportunity to extend the economies obtained from the operation of modern power. The savings already accomplished on a number of roads and what can logically be expected will be discussed in the next of the "Operating Economy Series"—an article which will appear in the next week's issue.

such equipment provides bridge and building forces with the power to load and unload and otherwise handle cars of sand, chemicals for water-softening plants, coal for stations, etc., where a locomotive crane is not immediately available or where rail equipment cannot be used. It has been demonstrated in scores of cases that tractors will pay for themselves on single jobs in such classes of work.

Big Savings in Highway Trucks

In addition to tractors and trailers, crane trucks and power lift trucks, the highway trucks are adapted to cut railway costs in many ways. In the supply departments, highway trucks, by hauling material from freight stations and depots to storehouses, and from storehouse to freight stations and depots, can eliminate the delays and expense of trap-car and switching service. Similar economies, including railway and train-service expense, can be eliminated by delivering material to labor groups which work in the vicinity of terminals. Drayage expense can be eliminated by trucking between manufacturers and shops in urban centers. Fleets of highway trucks have completely dispensed with the inconvenience and cost of supply-train work and other operating costs in some congested centers, and single trucks have saved thousands of dollars during their life by meeting emergency demands for materials as much as 50 or 100 miles from supply points.

Bridge and building gangs have reported striking economies by using highway trucks to eliminate the necessity of storing materials to protect the work from interruption and loss of time getting men to the work and by using the power to assist in loading, lifting and pulling. Store departments can also use highway trucks profitably in repairing their roadways and keeping them clear of snow and ice in winter. Reports of one road indicate that its highway trucks and automobiles pay for themselves every year through the savings in reduced forces, car-repair costs, switching charges, etc.

Cost of Equipment

The cost of tractors, crane trucks, lift trucks and lift-truck equipment ranges from $1,000 to $4,000 per unit, depending upon the type, size and strength, and the capitalized cost, including all operating and maintenance charges, and depreciation, is roughly equivalent to the cost of one laborer. In return for this expense, the tractor will do the work of several men. Yet, labor is usually not antagonistic to the introduction of such devices because they reduce the drudgery, afford the means of carrying out the work with greater dispatch and eliminate the hazard of many operations. Their introduction is also facilitated by the fact that elaborate changes in handling layouts are seldom required and by the fact that large installations can often be arranged so that the payments are deferred on the basis of guaranteed savings. There are few methods of securing economies in railway service within as easy access as motorized equipment for handling materials. They can be purchased like merchandise and produce positive results wherever and whenever the power is turned on.

WIDESPREAD BUSINESS RECOVERY is indicated by the variety of exhibits and the buying frame of mind of the nations which will attend the Leipzig Trade Fair from August 30 to September 3. The historic German Fair, approaching its 700th anniversary, has long served as a barometer of business conditions and tendencies. The Fall Fair will attract 180,000 buyers from 72 countries, including 1,500 from all parts of the United States, which country will also be represented with some 200 exhibits.

S. P. a Leader in Transport Co-ordination

THE Southern Pacific (Pacific System) in the first six months of this year had operating revenues of $76,414,760, a decline of 18.3 per cent from the same period in 1930. Maintenance of way expenses, however, comparing the same two periods, were reduced 23.6 per cent; maintenance of equipment expenses, 21.5 per cent; and transportation expenses, 14.3 per cent. Total operating expenses were 17.4 per cent lower and the operating ratio—75.3 for the first six months of 1931—was less than one point above that for the same period in 1930. Net railway operating income, naturally, suffered severely and, totaling $9,456,193, was 32.3 per cent under the total for the first half of 1930.

The Texas and Louisiana lines fared somewhat worse from the standpoint of revenues, the total of $23,727,629 for the first six months of 1931 being 22.8 per cent under that for the first half of 1930. Both maintenance of way and maintenance of equipment expenses, however, were reduced by more than 26 per cent. Transportation expenses were lowered by 16.5 per cent and total operating expenses by 20.4 per cent. The operating ratio rose 2.6 points to 84.1. Net railway operating income totaled $686,396, a decline of 69.2 per cent from the first half of 1930.

Table I—Comparison of Selected Freight Operating Statistics—Five Months

	S. P.-Pac. Lines		T. & N. O.	
	1931	Per cent of change from 1930 +Inc. or —Dec.	1931	Per cent of change from 1930 +Inc. or —Dec.
Mileage operated	8,961	...	4,686	— 0.3
Gross ton-miles (thousands)	11,159,446	—18.0	4,056,276	—16.6
Net ton-miles (thousands)	3,747,795	—23.1	1,448,620	—19.5
Freight train-miles (thousands)	5,765	—16.7	2,758	—21.6
Freight locomotive-miles (thousands)	6,832	—20.0	2,773	—21.6
Freight car-miles (thousands)	290,922	—17.4	107,804	—15.7
Freight train-hours	389,683	—22.1	180,012	—24.1
Car-miles per day	29.4	—16.4	27.6	—15.9
Net tons per loaded car	20.7	— 6.3	21.8	— 2.7
Per cent loaded to total car-miles	62.3	— 0.8	61.7	— 1.9
Net ton-miles per car day	379	—22.2	371	—19.5
Freight cars per train	51.4	— 1.0	40.0	+ 7.3
Gross tons per train	1,936	— 1.6	1,471	+ 6.4
Net tons per train	650	— 7.8	525	+ 2.5
Train speed, miles per train hr.	14.8	+ 7.3	15.3	+ 3.4
Gross ton-miles per train-hour	28,637	+ 5.3	22,533	+ 9.8
Net ton-miles per train-hour	9,618	— 1.3	8,047	+ 6.0
Lb. coal per 1,000 gross ton-miles	118	— 2.4	94	— 3.1
Loco. miles per loco. day	49.3	—21.0	53.9	—24.6
Per cent freight locos. unserviceable	28.1	+22.2	27.7	+77.6
Per cent freight cars unserviceable	5.9	+ 5.4	5.4	+35.0

In 1930 the Southern Pacific System had total operating revenues of $258,758,129 and net operating revenues of $71,113,267, comparing with similar figures for 1929 of $310,969,138 and $91,270,735. The net income of the system in the year 1930—$30,684,103—was equivalent to $8.24 per share on outstanding capital stock, as compared with $12.74 earned per share in 1929. For the twelve months ended June 30 this year per share earnings were $6.40—still above the $6 required to meet the present dividend rate. Income available for fixed charges was 1.98 times such charges in 1930 and 1.7 times these charges in the twelve months ended June 30 of this year. The balance sheet of the Southern Pacific Lines at the end of 1930 showed stock outstanding to the amount of $762,174,870 and long term debt of $823,255,051. Its corporate surplus

stood at $521,350,739, which last figure explains in large measure why, with earnings in 1930 which represented a return of but 2.85 per cent on the capital investment, the road was still able to earn $8.24 per share of stock.

The tax gatherer's activities in 1930 were more noticeable, due to lower earnings. They were somewhat less than in 1929, it is true, because of lower taxable income. Nevertheless they reached a total of $19,241,662, which may be compared with the dividends paid to stockholders, which totaled only three million more. The railway is thus being operated almost as much in the interest of the taxing authorities as it is for the benefit of its lawful owners. In 1930 of total net revenue from railway operations 27.1 per cent was garnered by the tax gatherers.

Table II—Revenues and Expenses—Six Months

	S. P. = Pac. Lines		T. & N. O.	
	1931	Per cent of change from 1930	1931	Per cent of change from 1930
Freight Revenues	$54,968,650	—18.4	$18,228,019	—23.6
Psgr. Revenues	14,511,214	—19.1	3,010,929	—32.3
Total Op. Revenues	76,414,760	—18.3	23,727,629	—22.8
M. of W. Exp.	9,508,513	—23.6	3,933,012	—26.2
M. of E. Exp.	13,487,462	—21.5	4,705,717	—26.4
Transp. Exp.	27,176,833	—14.3	8,829,463	—16.5
Total Op. Exp.	57,506,417	—17.4	19,948,348	—20.4
Op. Ratio	75.3	+ 1.2	84.1	+ 3.2
Net from Ry. Op.	18,908,343	—20.8	3,779,281	—33.5
Net Ry. Op. Income	9,456,193	—32.3	686,396	—69.2

In the last year or two a great deal has been said about transport "co-ordination," without comparable progress actually being made in the direction of this goal. There are several outstanding exceptions, however, which must be noted, and among them is the Southern Pacific. This company owns a one-third interest in a bus line which operates 670 buses over 10,735 miles of route and has more than two-thirds of the ownership of another line which operates 127 buses over 841 miles of route. Its wholly-owned electric lines, moreover, operate 157 buses over 239 miles of route and have one-half interest in another bus line which operates 148 buses over 51 miles of route. The company thus has an important financial interest in bus lines operating over 1,100 buses on routes totaling almost 12,000 miles. In addition it controls several transport companies which provide store-door collection and delivery by motor trucks, co-ordinated with train service, which service was described in the *Railway Age* of July 25, page 141. This step toward meeting the competition of long-haul trucks for freight is one of the most thorough-going and significant yet undertaken and the new service is being rapidly expanded. At the end of 1930 this service was offered at 473 important stations. Both the volume of traffic handled in this service and its revenues increased materially in 1930 in spite of the general business recession and, during the current year of growing depression, has shown a still more remarkable growth. Moreover, the Southern Pacific is an important operator of shipping, with a fleet of 19 ocean steamships and sundry other vessels. It also controls a large automobile ferry company operating in San Francisco bay and holds a substantial interest in a pipe line.

The company handles a widely diversified range of high grade traffic, which was divided on a tonnage basis in 1930 as follows: 18.40 per cent products of agriculture; 2.05 per cent animal products; 29.27 per cent products of mines (coal only 1.27 per cent); 17.79 per cent forest products; 20.13 per cent manufactures and miscellaneous; and 2.36 per cent l.c.l. The emphasis on high grade traffic, of course, results in higher average ton-mile earnings—1.358 cents in 1930—than would obtain if the emphasis were on lower-rated bulk commodities. The average haul in freight service in 1930 was 260.79 miles.

A factor of considerable strength from a traffic standpoint in the position of the Southern Pacific is its heavy tonnage of perishables, a traffic which has held up well during the period of depression. This year's crop of cantaloupes was heavy and a large tonnage of citrus fruits is in prospect. The Southern Pacific by its penetration of all the great irrigated valleys of California is in an excellent position to benefit from the growth of the high grade tonnage resulting from the changing food habits of the American people.

The outlook for its line in Mexico is believed to be somewhat brighter, although it appears that the tariff against imported vegetables, which S. P. Mexican territory could supply in quantity during the winter months when American production is low, is somewhat of a handicap to the full development of traffic on this line.

The S. P. is also favored by the fact that such a large percentage of the industries in its territory are located directly on its lines, eliminating the necessity for an intervening truck haul or short haul over another railroad. It is particularly well situated in this respect in Texas and if it can secure an outlet into Eastern territory gateways, which it is so earnestly striving to do, it should be able to realize to a greater degree upon this advantage. The company has maintained a consistent policy of capital expenditures to improve its service and operating efficiency. The prospective growth in production in its territory and its vigor in co-ordinating its services with highway and water transport combine to assure it a promising future—provided it, with the rest of the railroads, can secure equable consideration from legislative and regulatory authorities in the matter of the competition which they have to meet from other forms of transport.

Table III—Southern Pacific Lines, Operating Results, Selected Items, 1916 to 1930

Year	Average mileage operated	Revenue ton miles Thousands	Revenue passenger miles Thousands	Rev. per ton mile, cents	Total operating revenues	Total operating expenses	Net operating revenues	Operating ratio	Net railway operating income	Net after charges	Net increase in investment in road and equipment
1916....	11,101	10,779,071	1,643,270	0.959	163,427,423	103,088,737	60,338,687	63.08	47,000,000	35,422,514	.....
1917....	11,137	13,419,091	2,024,391	0.923	193,971,490	120,601,823	73,369,667	62.18	62,000,000	49,129,417	30,197,564
1918....	11,102	12,765,384	2,217,532	1.113	221,611,206	162,722,372	58,888,834	73.43	51,000,000	28,684,916	14,713,564
1919....	11,043	11,933,299	2,379,026	1.286	239,657,272	188,385,172	51,272,100	78.61	39,677,068	31,548,607	10,726,144
1920....	11,151	12,951,778	2,407,400	1.364	282,269,504	242,113,790	40,155,714	85.77	21,312,344	32,070,275	15,661,012
1921....	11,188	10,079,305	1,823,478	1.704	269,494,365	212,572,263	56,922,103	78.88	35,946,791	30,618,778	32,800,834
1922....	11,224	10,837,265	1,812,335	1.563	262,519,170	193,664,456	68,854,713	73.77	46,222,846	32,600,150	8,984,749
1923....	11,232	13,000,879	1,946,416	1.437	287,204,635	207,166,588	80,038,047	72.13	54,228,023	44,552,482	51,471,243
1924....	11,476	13,142,848	1,841,391	1.397	275,904,111	203,051,329	72,852,782	73.59	48,101,416	35,754,416	141,868,180
1925....	12,950	14,581,435	1,858,622	1.382	293,074,553	215,609,318	77,465,235	73.57	50,313,759	37,916,317	83,033,192
1926....	13,280	14,724,693	1,837,935	1.401	298,800,998	215,595,480	83,205,518	72.15	55,796,718	42,034,665	58,788,356
1927....	13,504	15,133,358	1,805,706	1.368	297,745,406	218,179,192	79,566,213	73.28	51,604,068	35,999,196	32,242,901
1928....	13,599	15,695,443	1,737,915	1.358	300,104,027	216,734,202	83,369,824	72.22	54,908,101	39,028,634	25,446,588
1929....	13,687	16,485,032	1,766,501	1.348	310,969,138	219,698,403	91,270,735	70.65	59,741,860	47,434,930	26,064,910
1930....	13,832	13,755,317	1,551,398	1.358	258,758,129	187,644,861	71,113,267	72.52	43,108,660	30,684,103	28,962,490

Standard return for operation during federal control, $48,167,343.

Looking West Through the Progressive Bay of the Erecting Shop —Note Some Box Cars Being Repaired to Fill in Operations

C. & O. Builds Model Car Shops at Russell, Ky.

Size and completeness of equipment, in conjunction with progressive method of repairs employed, give facilities large output

TO meet its requirements for enlarged and up-to-date steel car repair facilities, the Chesapeake & Ohio has developed at Russell, Ky., what are probably the largest and most up-to-date steel freight car repair shops in the country. Extending over an area of about 100 acres, these shops, which were completed last year, include a rivet burning shop, an erecting shop, a paint shop, wheel, truck and blacksmith shops, a storehouse and office building, a powerhouse, a car sandblast plant, a priming shed and a most effective layout of storage and working tracks. Fully as interesting as the shop buildings themselves are the layout of the various facilities and the progressive system of repairs employed, which will permit the handling of 289 cars through the shop at one time and an output of 40 cars in an 8-hr. day when working to full capacity.

Prior to the completion of the new facilities, the steel car repair work on the Chesapeake & Ohio had been done largely at Huntington, W. Va., in the open, and without adequate mechanical lifting equipment. With the need for new facilities and the rebuilding and enlargement of the locomotive shops at Huntington, it was decided to construct the new car shops at Russell, this point being selected primarily because it is the center of gravity of freight car movement on the Chesapeake & Ohio and contains the largest yards and engine terminal on the road.

The shop layout extends in an easterly-westerly direction in line with and directly west of the main yards at Russell, on a site which required approximately 225,000 cu. yd. of grading to level it off. The arrangement of the facilities is such that there is practically straight line movement through the shop, with adequate trackage between the different units for car storage to prevent delay to work in any one unit by lack of progress in any other unit. Movement through the shop is from east to west, and the first facility provided at the east end of the new layout, therefore, in a five-track, 160-car, stub-end car-storage yard, with individual tracks about 1,600 ft. long, where bad-order cars are classified and held ready to be moved through the shop.

Immediately north of the storage tracks and parallel with them is the rivet burning shop, and 1,100 ft. to the west is the large erecting shop, in conjunction with which are the truck, wheel and blacksmith shops, as well as the storehouse and large ground storage areas. The paint shop is located about 250 ft. west of the erecting shop and immediately south of long extensions to the erecting shop tracks, where the rebuilt cars can be held, if necessary, awaiting their turn in the paint shop.

Details of Rivet Burning Shop

The rivet burning shop is a steel frame structure on concrete footings, entirely enclosed, except for a 9½-

ft. brick base wall, doors, sash and skylights, with asbestos-protected corrugated metal. This unit, which is 700 ft. long by 80 ft. wide, has a simple double-pitched roof supported by steel trusses, with ventilators along the ridge at intervals of 25 ft. and continuous rows of depressed-head skylights on each side of the ridge.

Both sides of the shop are fitted with extensive areas of sectional steel sash, the lower sections being provided with motor-operated ventilating sections. All of the wall sash, as well as the skylights, are glazed with hammered glass to afford diffused uniform light throughout the shop. Heating is by means of unit heaters suspended along the walls at intervals, about 20 ft. above the floor.

Within the Rivet Burning Shop Showing General Arrangement of Facilities

Artificial lighting of the shop is effected by means of high-power electric ceiling and wall lights, equipped with enamel reflectors. The effectiveness of this lighting, as well as the daylighting, is increased by the fact that the entire interior of the shop above the brick base course is painted with aluminum paint.

Three tracks are provided through the shop, these being laid 24 ft. center to center on cinders, which is also used as flooring between the tracks. Entrance to or exit from the shop over the tracks is through four-section, bi-folding wooden doors, glazed in their upper halves.

Rivets Burned by Electricity

Work within the rivet burning shop is essentially that of dismantling car bodies, entirely or in part. The two outside tracks through the shop are used for the rivet-burning work, while the center track is used by scrap cars, into which are loaded the steel plates and other parts removed from cars being dismantled.

All rivet-cutting work within the shop is done electrically, power being furnished by three 75-volt, 2,000-ampere, direct-current generators, with circuits extending to 14 resistance stations, each of which controls the current to two cutting electrodes. In removing a rivet, the operator has only to touch the head of the rivet with the electrode, the heat of the resulting arc melting the rivet head in approximately 30 sec. As the heads are removed, the rivets are backed out with special pneumatic punches.

In order to simplify rivet cutting near the tops of cars, both outside tracks are fitted with scaffolds along each side. These scaffolds, which are about six feet high, are made up of removable plank platforms, about 20 in. wide, supported on removable posts cut from old superheater flues, to which steel brackets were welded.

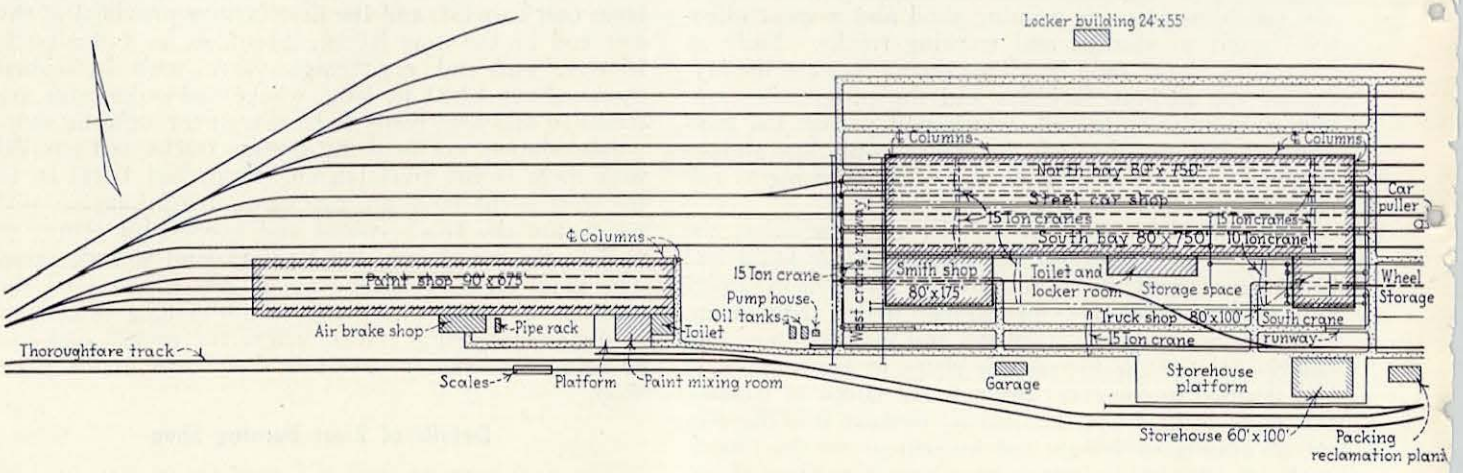
In the usual operation of the rivet burning shop, program work is handled generally on the most southerly track and miscellaneous work on the most northerly track, although this arrangement is altered as necessary to meet unusual conditions. All old plates removed are cut into commercial sizes and loaded directly into cars on the intermediate track. Handling of this material is done by a five-ton traveling crane, equipped with a magnet, which operates throughout the full length of the shop.

Erecting Shop a Large Structure

The erecting shop, which is 750 ft. long by 160 ft. wide, is divided into two longitudinal bays, 80 ft. wide, each having three tracks on 24-ft. centers longitudinally throughout its length. This main building is supplemented at its southwest corner by a lean-to unit, 175 ft. long by 80 ft. wide, containing a blacksmith and fitting-up shop, and on its southeast corner by another lean-to unit, 100 ft. long by 80 ft. wide, designed and equipped as a truck shop. The wheel facilities are immediately east of the truck shop.

The main shop building, together with the truck and blacksmith units, is essentially a steel-frame, brick-wall structure supported on concrete footings, although to provide for future extensions, its north wall, and its south wall between the truck and blacksmith units, are constructed temporarily of corrugated asbestos-protected metal.

The erecting shop is open throughout its interior and is covered by a two-part, double-pitched roof supported on steel roof trusses, which, in turn, are carried on side



West Half of Steel Car Shop Layout at Russell, Ky.

wall columns and a central row of columns longitudinally through the shop. The roof covering throughout is of cement tile protected by built-up roofing.

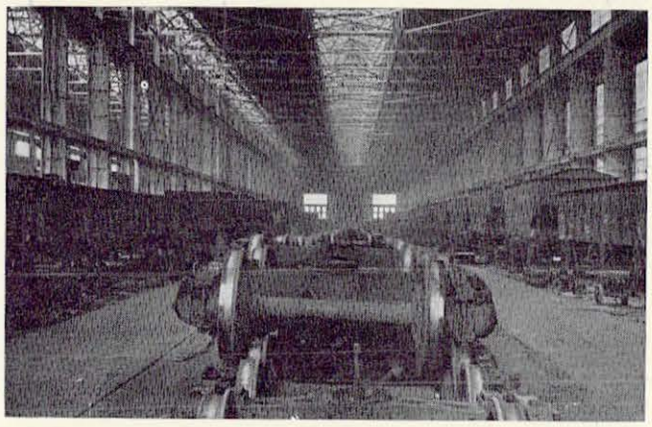
Continuous lines of skylights with ventilators at intervals provide overhead light and ventilation to the two bays. All of the skylights throughout the different units, and the sash as well, are glazed with hammered glass. Artificial lighting within the erecting and auxiliary shop units is by ceiling, wall and column lights, equipped with enamel reflectors. The entire interior is painted with aluminum paint. Heating of the shop units is by means of floor-type unit heaters with high-level exhausts.

The car doors in the erecting, truck and blacksmith shops are of two types; four-section bi-folding wooden doors and rolling steel doors. Practically the entire west end of the erecting shop is a series of doors, the outside tracks in each of the two bays passing through openings protected by bi-folding doors, while the center track in each case passes through a wide opening, the full height of the building, which is fitted with a rolling steel door. Directly above the four bi-folding doors at this end of the building are rolling steel door sections with top-hinged guide mullions, which can be raised to afford a clear opening across the entire width of the building. This arrangement permits the free movement of overhead electric traveling cranes, with which each of the main bays is equipped, into and out of the west end of the building. For the same purpose, both ends of the blacksmith shop and the west end of the truck shop are equipped in practically the same manner, all of the rolling steel doors and hinged guide mullions being motor operated with push-button control.

Work is Classified in Erecting Shop

All cars brought to the Russell shop for repairs, except those requiring emergency repairs, are scheduled for shopping several months in advance. As received from the rivet-burning shop, the cars are grouped according to the nature of the repairs required, if this has not been done already, into either two or three classes, depending on the nature or extent of repairs. All heavy repair and general overhauling work is programed and handled through the south bay of the erecting shop, using what is termed the progressive method, whereas cars requiring only minor repairs or repairs to a specific part, are handled in the north bay of the shop or on repair tracks along the north side of the building, using what is called the non-progressive method of repair.

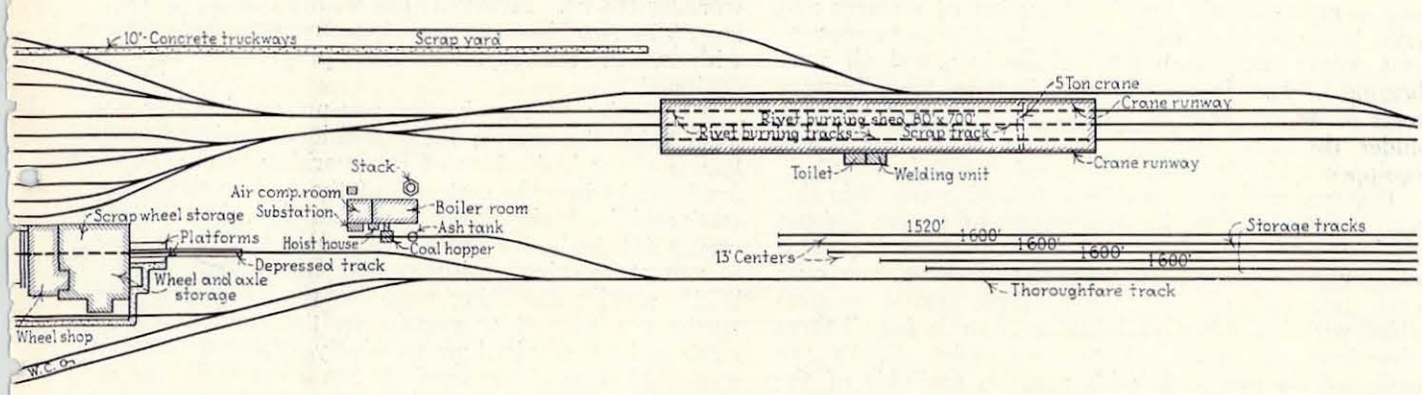
In the progressive bay, the two outside tracks rest on and are surrounded by a cinder floor, while the center track is laid on and enclosed with concrete, flush with the tops of the rails, to form a truckingway. Cars assigned to this bay are pulled into the east end of the bay on the center track by a winch, where their bodies are picked up by one or both of two 15-ton overhead traveling cranes and are set on wooden benches or horses on either side of either of the two outside tracks. While further stripping is being done on the bodies in this position, if such is necessary, the trucks are rolled back to the east end of the building, and then to the



Looking West Through the Non-Progressive Bay of the Erecting Shop, Showing a Large Number of Cars Under Repair

truck shop, where there are five tracks. All of the tracks in the truck shop are raised 20 in. above the general level of the concrete floor to facilitate work on the trucks, the center track being encased in an elevated concrete truckingway, while the rails of the other four tracks are set up on reinforced concrete stringers. In addition to its raised tracks, the truck shop is equipped with a 10-ton traveling crane operating over all five tracks, and four 5-ton electric hoists, arranged in two groups of two each over the two tracks on each side of the center track.

While repairs are being made to the truck frames, the truck wheels are given attention in the wheel shop immediately east of the truck shop. This shop is a one-story brick structure, 144 ft. long by 50 ft. wide, with a wood block floor, located centrally between wheel storage space west of it and scrap wheel storage and axle storage space east of it. The principal equipment within and about the wheel shop includes a depressed unloading track, a demounting press, wheel, axle and journal lathes, a wheel borer, a mounting press and three one-ton monorail systems for transporting wheels and axles.



East Half of the Car Repair Facilities

When repaired wheels have been returned to the truck shop and reassembled with their respective trucks, the trucks are rolled back into the progressive bay of the erecting shop, where they are reassembled with their respective car bodies. The cars are then set on either of the two outside tracks of the bay by the overhead cranes, these tracks constituting independent lines of assembly, progressing westward through the shop. Altogether there are nine general steps or operations in the assembly work to complete the rebuilding of the cars, ready for the paint shop.

Progressive Operations are Well Organized

Much of the uniform progress made in the progressive assembly lines is due to close co-operation with the blacksmith and fitting-up shop, which prepares all of the platework for assembly and keeps a step ahead of assembly operations. The principal work in the blacksmith shop is the complete assembly of car sides, ends, cross-hoods and door mechanisms, so that these units can be delivered to the progressive bay fully prepared for joining up in the car body assembly lines. In order to enable the blacksmith shop to keep up with the assembly work, it is equipped with two riveting pits, 100 ft. long by 12 ft. deep, each of which is served by pneumatic gap riveters. All handling of heavy parts within the shop and from the shop into the erecting shop, is by overhead traveling cranes.

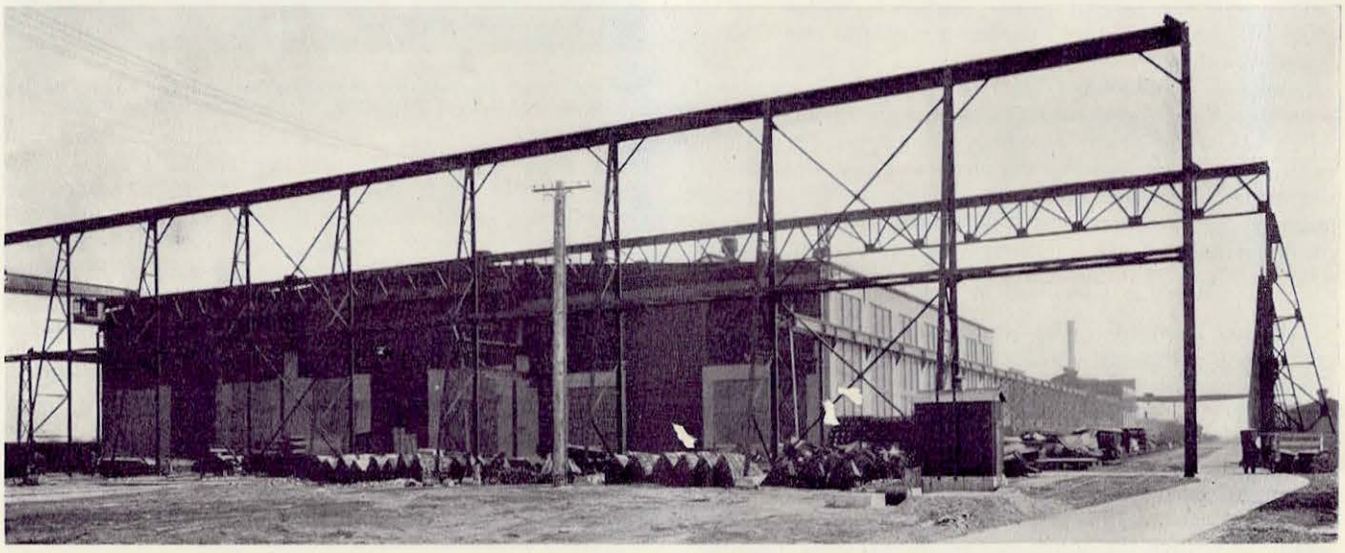
In order to facilitate further the repair and assembly work on cars in the lines of assembly of the progressive bay, compressed air for the operation of reamers and rivet hammers is piped from overhead lines to convenient points along each side of the bay, and all rivet heating is done in electric rivet heaters, there being a total of 48 of these in the shop. To facilitate work under the cars, both of the progressive tracks are equipped with pits, these being about 480 ft. long.

Hoisting with the two 15-ton traveling cranes in this bay is supplemented by two groups of twelve 2½-ton electric traveling cranes, each group operating on a continuous overhead runway 450 ft. long, one over each progressive track. All of these cranes are provided with individual push-button controls for all three directions of travel. Both progressive tracks are equipped on each side with portable scaffolds of the same type that is provided in the rivet burning shop.

As a result of the careful arrangement of the shop facilities and the thoroughness with which the shop is equipped, the movement of cars through the shop can be stepped up considerably above what it could be otherwise. The progressive schedule of operations designed for the shop, with full forces at work, requires that all trucks removed from cars for repairs in the truck shop, must be repaired and returned to the cars to which they are assigned within a period of five working hours. Under similar conditions, cars passing through the progressive stages of repairs are required to move from one point to the next every 40 min., a schedule which contemplates an output of 12 cars from each progressive track in 8 working hours.

Non-Progressive Bay

The non-progressive bay of the erecting shop is the same size as the progressive bay, and, like the progressive bay, has three tracks 24 ft. center to center. Of these three tracks, the outside tracks are working tracks, while the center track is used for material delivery and truck repair work. Both outside tracks are laid in the cinder floor of the bay, as is also the west half of the center track. The east half of the center track is, however, elevated on 12-in. reinforced concrete stringers to facilitate repairs on car trucks.



The Erecting Shop As Seen from the West, Showing Some of the Crane Equipment Serving It

Part of the center track is used for bringing in certain classes of repair materials in carloads, but the principal method of handling supplies into the bay is by tractors and trailers over two eight-foot concrete truckingways longitudinally between the center track and the working tracks. Heavy lifting within the bay is done largely by two 15-ton overhead electric traveling cranes, with which the bay, like the progressive bay, is equipped.

All repairs to cars in the non-progressive bay are made with the cars in fixed positions, on benches or horses along both sides of the working tracks. Cars are brought into the east end of the bay on the center track and, immediately inside the building, the traveling cranes lift the bodies from their trucks and carry them to vacant working positions along the outside tracks. While repairs are being made to the car bodies, the trucks are allowed to remain on the elevated center track and are repaired progressively as they are moved westward through the bay. When a car body and its trucks have both been repaired, they are moved to the west end of the bay by one of the cranes, where they

are assembled on the center track, ready for painting or road service. Thirty cars can be under repair in this bay at one time, and, with average repairs and a full force working, the daily output of the bay is scheduled at about 16 cars.

Paint Shop Holds 80 Cars

The third main unit of the shop facilities is the paint shop, which is a steel-frame, red-brick structure, 675 ft. long by 90 ft. wide. The roof of the building is of the double-pitched type, and is constructed of cement tile carried on structural steel roof trusses which span the full width of the building. Thirty six-inch ventilators along the ridge of the roof provide overhead ventilation and a row of continuous skylights on each side of the ridge, glazed with corrugated wire glass, afford overhead diffused lighting. In other respects the building corresponds closely to those previously described.

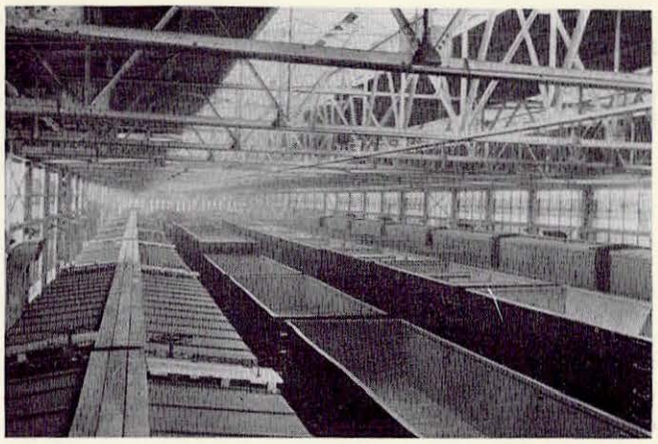
The floor of the shop is of concrete throughout and is provided with five stub tracks, 16 ft. 6 in. center to center, and having a combined capacity of 80 cars. These tracks enter the west end of the building through bi-folding wooden doors. In order to facilitate the painting of car trucks and underframes, the rails of the tracks are laid on reinforced concrete stringers integral with the concrete floor and 12 in. high, to which they are attached by special rail clamps.

Painting within the shop is done by portable spraying equipment, air for which is supplied by compressors in the powerhouse and carried throughout the shop in 2-in. pipe lines along each side of each track, near the floor, with take-offs at intervals of 50 ft. Mixing of the paint is done in a separate paint mixing room, 60 ft. by 40 ft., constructed as an annex to the building proper near its southeast corner. This facility, which is provided with a concrete platfrom on two sides, can receive paints and painting materials either by trucks over a concrete truckingway or directly in cars over a spur track serving its platform.

Another auxiliary to the main paint shop is an air brake and pipe shop, about 78 ft. long by 25 ft. wide, which is located about centrally along the south side of the main building. This unit is used for making repairs to air brake equipment while the cars are being painted. The average time required for cars in the paint shop is two days.

In order to paint all of the coal cars on a definite program, at intervals of about three years, at which time only light repairs are necessary, these cars are handled on tracks outside of the main erecting shop where a special pneumatic straightening jack is located for straightening the sides and top angles before sand blasting and painting. Necessary repairs are made on these same tracks to put the cars in serviceable condition.

Other facilities of special interest at the Russell shops include the stores facilities and the shop powerhouse provided. The stores facilities include a brick storehouse, 100 ft. by 60 ft., with a large storage platform, served by a supply track, and large storage space, for the storage of heavy materials, along the south side of the erecting shop. The large ground storage space is paved with cinders and is served by a 15-ton traveling electric crane which operates on an overhead runway, 80 ft. wide by 750 ft. long. At the west end of the erecting shop the long crane runway intersects the runway of another 15-ton traveling crane which travels across the west end of the shop, an arrangement which makes it possible to move heavy materials and parts from storage directly to the west entrance of either the progressive or non-progressive bays of the shop, and



Inside the Paint Shop, Showing the Favorable Conditions Afforded for Painting Work

thence into the shop by the 15-ton cranes serving these bays. In addition to the extensive crane equipment provided for handling materials, the storage area and all of the different shop units are served with concrete truckingways.

Well Equipped Powerhouse Provided

The powerhouse at the shop, which is of the same general type of construction as the erecting and paint shops, is located about 600 ft. east of the erecting shop and is designed essentially to supply compressed air and heat to the different shop units. For these purposes it is equipped with two 381-hp. Sterling stoker-fired boilers, a 175-ft., radial-brick chimney, and two air compressor units, each with a capacity of 2,600 cu. ft. of free air per minute. All coal to the plant is delivered over a track hopper and is raised to overhead bunkers in the house by a skip hoist, while all cinders are conveyed through a steam ejector system to an elevated storage tank, with a loading hopper directly over the same track used for the coal supply.

The entire shop layout at Russell was planned and constructed under the direction of C. W. Johns, chief engineer of the Chesapeake & Ohio, with the cooperation of J. W. Small, chief mechanical officer of the road. L. T. Nuckols, district engineer, was in direct charge of the work, assisted by W. R. Talbot, resident engineer. Actual construction was done under contract by the Hughes-Foulkrod Company, Philadelphia, Pa., represented by Hugh Alexander, construction superintendent.

* * *

A Delaware Valley Motor Coach at East Stroudsburg, Pa.

Atlanta Testimony Unfavorable to Rate Rise

FOUR days of testimony, mostly in opposition, on the proposed 15 per cent increase in freight rates, was on the records of the Interstate Commerce Commission as a result of the hearing at Atlanta when on August 21 Commissioner J. B. Eastman and his staff left for Dallas, Tex., to conduct a similar hearing. The testimony was offered by leaders of various southern industrial, business and agricultural associations, individual freight tariff bureaus and representatives of individual shipping interests, the major portion having been reported in last week's *Railway Age*.

The Georgia House of Representatives, on August 20, adopted a resolution calling upon the commission, instead of granting an increase in rates, to reduce the existing tariffs, described as "unreasonably high." The resolution stated that the South is undergoing the gravest industrial and agricultural crisis since the Civil War. The testimony showed almost every class of business, industry and agriculture to be opposed to the increase, while representatives of several agricultural and iron interests testified their business would be wiped out if rates were raised.

J. K. Moore, New Orleans, representing the American Cotton Co-operative Association, and J. T. Ryan, representing the Southern Furniture Manufacturers' Association, declared their respective industries, suffering from drastic decreases in market prices, will turn to water and truck transportation, should the rate rise be granted. Mr. Moore predicted that by the end of the next cotton season, W. R. Cole, president of the Louisville & Nashville and official spokesman for the carriers, will be convinced that he "made a grave error in his calculations" [illegible] Washington that the cotton industry can stand an increase. A reduction, rather than an increase—on cotton rates at least—would be more profitable to the carriers, Mr. Moore said.

Eugene Talmadge, Georgia commissioner of agriculture, appeared in protest against the proposal and declared, in reference to the condition of the Georgia peach industry, that although certain so called "technical reductions" had been granted by the carriers, the shippers of carload lots found that when they settled their bills, they were actually paying more for transportation than heretofore. Describing alleged discrimination in freight rates, Commissioner Talmadge said, "It is now possible to ship apples from Oregon to Atlanta almost as cheap as they can be shipped from Cornelia, Ga., to Savannah. One is a haul of three hundred miles. The other, a haul of three thousand miles. Where is the logic in this? Where is the justice?"

J. H. Donnell, manager of the Tampa, Fla., Traffic Bureau, said that present rates south of Jacksonville are 15 per cent higher than anywhere else in the South and that an increase would mean serious loss of revenue to the railroads. Thomas E. Grady of the Miami Rate and Traffic Board, pointed to the daily steamship services from that part as an alternative, should the higher rate be put in effect.

Earle L. Wirt, chairman of the board of the Florida Citrus Exchange, and R. M. Pratt, manager of the Citrus Growers Association, entered strong protests. Alleging an extremely thin margin of profit at present, they said the increase would cause a temporary abandonment of many orchards, while others, even though preferring rail transportation, would be compelled to ship by truck. G. H. Carson, Savannah, representing the naval stores industry, said these shippers would turn to water transportation. Pointing out the price reductions in many other industries, he said existing freight rates are too high and should be lowered, rather than increased. W. A. Leffler, another naval stores representative, described the proposal as "unsafe and unsound."

George H. Deiter appeared for the United States Fisheries Association, an organization controlling much of the sea food shipments from the Georgia and Florida coasts. He described the proposal as an effort to offset the heavy losses in passenger traffic revenues. He said the plan is "unfair and discriminatory to the consumers as well as the shippers," and that the carriers "should seek to cover their losses elsewhere and not at the expense of those already overburdened."

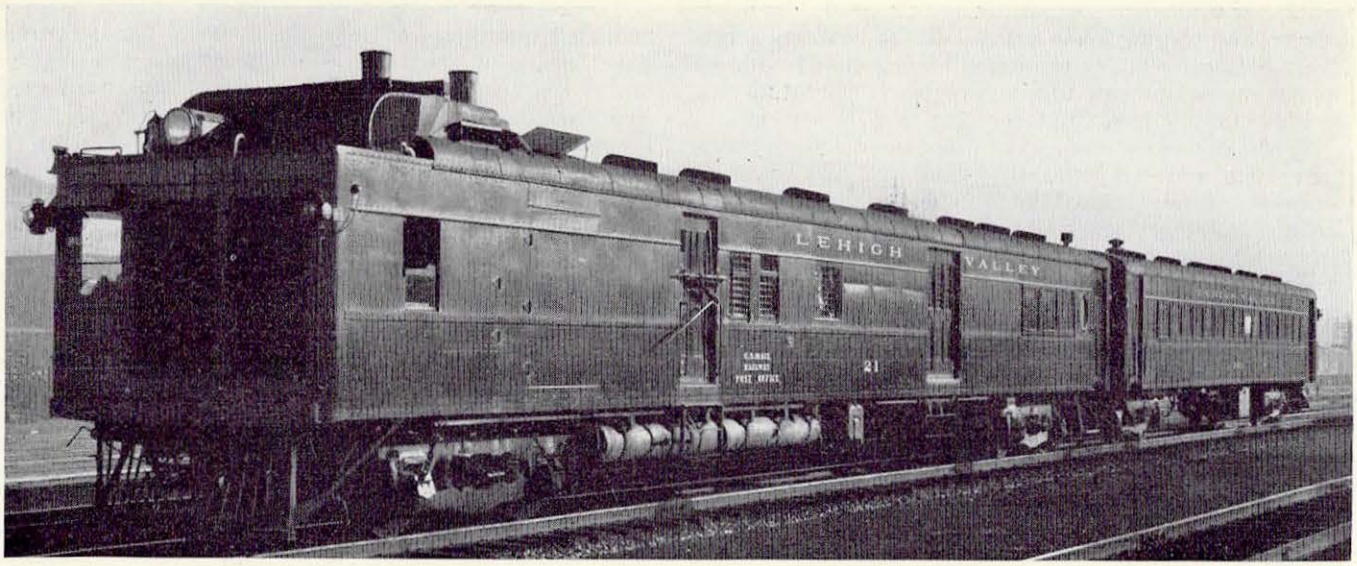
C. L. Street, president of the Florida Grapefruit Canners Association, said the railroads are necessary but not vital, yet are asking the special privilege of increased rates, while every other industry in the country is reducing its charges. Existing rates are already driving growers and canners to highway transportation, he said.

Dallas Freight Hearing

Objectors to the proposed 15 per cent freight rate increase were heard at Dallas, Tex., on August 21-25, at the regional hearing conducted by Commissioner Joseph B. Eastman, and examiners Howard Hosmer and H. W. Arcer. Seated with the representatives of the Interstate Commerce Commission were Paul Walker, a member of the Oklahoma Public Service Commission, C. V. Terrell, a member of the Texas Railroad Commission, and A. R. McDonald, a member of the Wisconsin Public Service Commission. C. B. Bee, traffic adviser for the corporation commission of Oklahoma, testified that the railroads had failed to [illegible] train economies in the face of losses before asking freight shippers to pay more. He said that the general level of freight rates throughout the central West is now 181 per cent of what it was in 1902, and that recent orders of the Interstate Commerce Commission will make this level 198 per cent of the 1902 level by December 31 of this year. "The trucking situation of Oklahoma" he said, "is such that the carriers cannot hope to maintain the present volume of traffic without changing the rate and they will certainly lose a heavy portion of the traffic if it is increased." He criticized the railroad's request as not being in his opinion, "a traffic manager's study," the operating and financial executives of the railroads having apparently prepared the request rather than the traffic officers. He also criticized the proposal for failing to attempt to iron out what he considered the present inequalities in the rate structure between various sections and territories of the country.

Mr. Bee said that truck competition would prevent the carriers from realizing a full 15 per cent increase in revenues in the event that the Interstate Commerce Commission allows the request and that the full brunt of the increase would fall on grain and wheat which are not subject to truck haul, upon livestock hauled in excess of 200 miles and on cotton hauled in excess of 400 miles.

Among others that testified were A. D. Beals, of the Arkansas Railroad Commission, H. J. Conley of the Ft. Smith, Chamber of Commerce, J. C. Murray of the Little Rock Chamber of Commerce, L. R. Wood, traffic manager of the State Highway Commission of Arkansas and E. N. Adams of Tulsa, Okla.



Rail Motor Cars and Trailers Are Saving Money for Lehigh Valley

Lehigh Valley Operates All Local Service With Rail Cars

Average savings, as compared with steam operation, in two years and six months equal original motor car cost

THE first rail motor car used by the Lehigh Valley, a straight gas car, with mechanical drive, of 68 hp., was placed in service in 1923. This car was assigned to a passenger run on a short branch line where it has rendered first-class service. To date it has been operated 200,000 miles, and has saved in operating costs, as compared with the steam service formerly maintained on this branch line, an amount equal to several times its original cost. While this car was entirely satisfactory for the service in which it was engaged, there was no other operation on the Lehigh Valley that could be handled by so light a car.

In the latter part of 1925, five gas-electric motor cars and special light-weight trailers were installed in local main line and branch line service. Regular additions have been made from time to time until 26 motor cars and 25 trailers are in operation, providing all the local passenger service on the main and branch lines of the railroad.

Trailers of Light-Weight Construction

With the exception of milk and express cars, all trailers handled by motor cars are of light-weight construction, following in practically all details the same general type of construction employed in motor cars. In the original survey of economies to be effected by motor car operation, it was determined that the hauling of heavy all-steel equipment by motor cars would not only handicap the performance of the cars as to speed, but would also reduce the economies that were to be expected as a result of motor car operation. Therefore, after due consideration of all angles, it was decided not to handle standard steel equipment as trailers, but to provide the required number of light-weight trailers for each motor car run. The use of such trailers reduced train weights and made faster schedules possible. It likewise reduced the cost of operating the motor trains from the standpoint of both fuel consumption and power plant maintenance, and, in addition, of course, released the standard steel coaches for through service.

Before arriving at the decision to supplant steam train service with rail motor cars, thorough traffic studies were conducted to determine where motor trains could be assigned to the best advantage from the standpoint of service and economy. The cars placed in operation in 1925 were powered with 220-hp. engines, and they have proved throughout their whole period of use to be well suited to the service for which they were intended, involving as it does, the operation of single motor cars, and in other instances, of a motor car and one trailer.

Subsequent traffic studies made in connection with the enlargement of the motor car program, demonstrated the need of greater power to provide faster schedules, and to handle an increased number of trailers. To meet this condition, the additional cars ordered were of the dual power plant type, and they have shown results comparable with those obtained from the single power plant cars. The increase in power in rail motor cars has been consistent with each addition made. Starting with 200 hp. in single plant cars, dual power plant cars of 440, 500, 550, and 600 hp. are now being operated. Obviously, the larger power plant cars are used in service

where schedules are comparatively fast, grade conditions severe, and trailing loads heavy. In the territory served there are many heavy grades to be negotiated with rail motor car equipment, and it is regularly operating over grades varying from 0.34 per cent to 2.78 per cent.

When rail motor cars were first under consideration, there was some thought that their use would necessitate a special organization in the mechancial department, for the servicing and maintenance of this equipment. Experience quickly disclosed that this was unnecessary as the rail motor car fitted very easily into the scheme of maintenance of steam power.

Rail Motor Dependability Satisfactory

Of the 26 motor cars in service on the Lehigh Valley, 24 are regularly assigned. The feature of greatest concern was that of dependability, and in this respect the equipment exceeded expectations. To cover the 24 assignments with reasonable security, it is necessary to have only two emergency cars. The average number of days per year that a car is out of service because of motor failure is 29. With this line-up of equipment, and proper regulation of shopping, the two emergency motors are sufficient.

The average number of miles run per car per day is 105, although on a run between Sayre, Pa., and Buffalo, N. Y., a motor car of 440 hp. averages 359 miles per day and handles one trailer. This particular motor is in service 95 per cent of the time.

Principal Operating Statistics of Lehigh Valley Rail Motor Cars

	Class of Motor Car as to Horsepower				
	68 *	200	220 †	440	500
Miles per station stop	1.1	3.9	1.3	4.5	3.3
Miles per day	93.3	205.8	63.7	359.6	203.1
Miles per month	2,837	6,260	1,906	10,938	6,177
Average days per month out of service	2.0	2.3	2.7	1.5	3.0
Number of failures in six months	5	6	2	4	5
Per cent of time in service	93.4	92.3	91.2	95.1	90.2
Equipment in addition to motor car	None	1 car	Frt. cars	1 car	1 car
Cost per train mile, in dollars:					
Wages	.2114	.2244	.5231	.1456	.1939
Fuel	.0482	.0968	.2667	.1225	.1242
Lubricants	.0098	.0086	.0169	.0276	.0119
Other supplies	.0035	.0017	.0027	.0059	.0024
Other expenses	.0293	.0212	.0055	.0215	.0261
Engine house expense	....	.0009	....	.0006	.0035
Miscellaneous expenses	....	.0027	....	....	....
Total, operating expense	.3023	.3563	.8150	.3237	.3620
Total, all expenses	.3697	.3966	.9815	.3453	.4173
Repairs per train mile, in dollars:					
Motor	.0327	.0176	.1299	.0077	.0364
Car	.0347	.0227	.0366	.0139	.0189
Total	.0674	.0403	.1665	.0216	.0553

* Straight gasoline drive.
† Performs switching service.

In its endeavor to employ motor cars in varied service, the Lehigh Valley has met with singular success. The present assignment of the 24 motor cars is classified as follows:

8 handling one trailer
4 handling two trailers
4 handling one trailer and occasionally an additional car
3 handling local freight cars, and switching, also passenger traffic
2 handling one trailer and two or three milk cars
1 handling one trailer and four milk cars
1 handling one trailer and one or two Pullmans or an express car
1 handling two trailers and one express car

Careful consideration was originally given to the use of motor coaches instead of rail motor cars on branch lines where the number of passengers to be carried would not exceed the capacity of a motor coach, but it was found that where this situation existed either the road conditions made the operation of a motor coach impracticable or the necessity of doing mail, express and freight work made the rail motor car desirable.

To determine the operation costs, an expense form is compiled monthly for each motor car. These figures have been compared with the cost of steam operation and it has been found that the average saving effected in 30 months is equal to the cost of the motor car. The accompanying tabulation shows the cost of operation of the motor cars grouped by horsepower, indicating the great economy over steam trains.

Savings in Maintenance

Aside from the saving in out-of-pocket expense that may be obtained, one feature that is often overlooked is the saving in equipment. For instance, a steam train of a baggage and mail car, a smoking car and a coach—a total of three cars—is supplanted by a motor car, which serves as a baggage and mail car, and an 84-seat trailer having one-third of the car reserved for smokers. It naturally follows that there is a reduction of about a half in the equipment to be maintained.

The Lehigh Valley feels that advances in the power and design of rail motor cars during the past five years have contributed much to their increased adaptability and dependability, and that there is every basis for assuming that the near future holds promise of still further improvements, not only in the horsepower available in the power unit, but also in refinements and details of design that will contribute to added fuel efficiency and decreased operating costs. These developments, this railroad's officers believe, will make possible the extension of rail motor equipment to service not heretofore considered possible with this type of equipment.

Government Investment in Railway Bonds Proposed

A REQUEST of counsel for the California Growers and Shippers Protective League for permission to subpoena officers of the Atchison, Topeka & Santa Fe, the Western Pacific and the Southern Pacific, during the rate hearing held before representatives of the Interstate Commerce Commission at San Francisco, Cal., on August 17 to 21, was denied when Commissioners William E. Lee and E. I. Lewis and Examiners G. H. Mattingly and Myron Witters, ruled that the counsel for objectors to the 15 per cent freight rate increase would not be permitted to subpoena executives of the railroads in an effort to prove that the increase would drive rail tonnage to waterway and highway competitors. Shipping interests such as the California Growers and Shippers Protective League, the California Pear Growers Association, the Growers and Shippers Association of the San Joaquin Valley, the Western Growers Protective Association of Los Angeles, the Canners' League of California, the California Walnut Growers Association, the Poultry Producers of Central California, the Pacific States Butter, Egg, Cheese and Poultry Association, the Pacific Pulp & Paper Traffic Association, the California Citrus League, the California Fruit Growers' Association, the California Fruit Growers Exchange and the American Fruit Growers of Southern California, endeavored to show that the proposed 15 per cent blanket increase in railroad rates would yield a net decrease in revenue for the rail carriers because of diversions of freight to truck and water

(Continued on page 331)

Railroads Pay Low Salaries

A. S. M. E. reports that salaries of mechanical engineers paid by the railroads compare only with those paid to the teaching profession—Considerably lower than the median earnings for the United States

A REPORT prepared by the Committee on the Economic Status of the Engineer, American Society of Mechanical Engineers, shows that the median earnings of mechanical engineers in railroad service are lower than the median earnings of mechanical engineers in any other industry in the United States. As shown in one of the charts, railroad earnings compare only with the median earnings of mechanical engineers engaged in teaching.

The survey and preparation of the report were directed by Professor Elliott Dunlap Smith of Yale University, and the statistical computation was directed by Professor Hudson B. Hastings, also of Yale University. The figures are based on 1930 earnings. At that time, the effects of the present depression had not seriously reached professional salaries, and only a few salary cuts had been made. Furthermore, the figures shown in the report do not refer to average, but to "median" earnings. To get the median earnings in any classification, the salaries of all the engineers in the classification are arranged in a column in order of amount. The total number of entries in the classification is then counted, and the salary figure in the middle of all the figures in the column is then taken as the median of the classification.

According to the report, the committee believes that median earnings give a truer picture than the average earnings, because the exceptional salaries of the few men at the top inflate the mathematical average far above the earnings of the typical man; while the median, which is determined by position in the earning scale, not by averaging of salaries, is uninfluenced by exceptional top salaries. Average earnings are usually much more than median earnings. For example, the report states that the average of 1930 professional earnings of mechanical engineers between the ages of 53 and 58 (the age of maximum earning power) was $10,200, which is more than 36 per cent greater than the median earnings at those ages, which was $7,600.

It is believed, the report states, that these figures are the most reliable that have been obtained as to engineering earnings. They are based on replies from over half of the membership of the American Society of Mechanical Engineers in the United States, which is approximately 18,000 members. A table in the report shows the distribution of engineers replying to the questionnaire by type of industry. Two per cent, or 127, of the questionnaires were returned by mechanical engineers employed in the railroad industry. The report states that, "although the number of returns from railroads is small, the results at all wage boundries are so consistent as apparently to justify the inference that railroads pay below the median wage almost from the start."

Referring to the chart showing a comparison of the 1930 median earnings of mechanical engineers by type of industry, it will be noted that the median earnings for mechanical engineers in the railroad industry is about $2,000, with three years out of college or at 25 years of age, and increases to slightly over $3,000 after the engineer has been about 13 years out of college. The median curve then rises rapidly to slightly over $6,000, at which time the mechanical engineer employed by a railroad has been out of college about 24 years and is approximately 45 years of age. The median line drops to $5,400 at 50 years of age and increases again to $6,100 at 55 years of age.

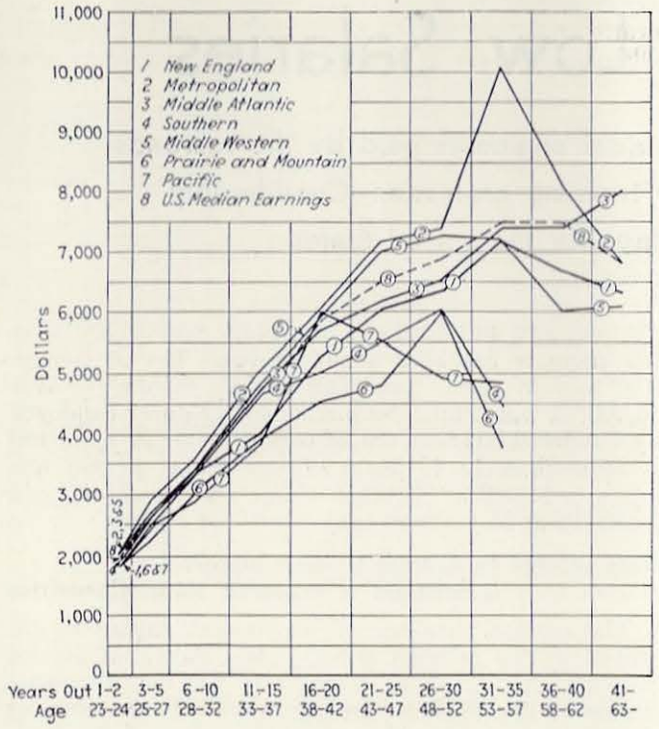
Data Secured by Railroad Division Support Conclusions of Economic-Status Committee

The median earnings of mechanical engineers employed by the railroad industry and shown in the report of the A.S.M.E. Committee on the Economic Status of the Engineer are approximately the same as the median earnings shown in the report of the Railroad Division, A.S.M.E., Sub-committee on Professional Service. Abstracts of the two reports submitted by the Railroad Division committee, which was composed of mechanical engineers employed in the railroad and railway supply industries, were published in the December 11, 1926, and March 24, 1928, issues of the *Railway Age*. A large part of the information with respect to earnings of mechanical engineers in the railroad industry, contained in the reports by the Railroad Division, was obtained from a report of hearings before the Committee on Interstate Commerce, United States Senate, in 1921. The Senate Committee report only included salaries of $5,000 and over. Only a few of the salary figures given in the report were less than $5,000. The Railroad Division Sub-Committee on Professional Service did secure considerable data relative to the positions paying less than $5,000, but was unable to check enough of these salary figures against individual careers to plot what it considered to be a proper median curve for all positions in the mechanical departments of railroads. As pointed out in the report, which was presented at a meeting of the Railroad Division in New York on March 14, 1928, data pertaining to earnings below $5,000 were too inadequate to plot an accurate curve showing median earnings below that amount.

The median earnings of mechanical engineers employed by railroads up to and including the position of chief of motive power was reported by the Railroad Division to be around $2,000 shortly after graduation from college; $4,300 ten years after graduation; $6,000 twenty years after graduation, and $6,600 thirty years after graduation from technical school. A comparison of median earnings shown in the reports of the A.S.M.E. Committee on the Economic Status of the Engineer and the Railroad Division Sub-Committee on Professional Service, shows the data to be essentially in agreement, and supports the conclusions arrived at by the A.S.M.E. Committee.

Salaries Do Not Decline With Age

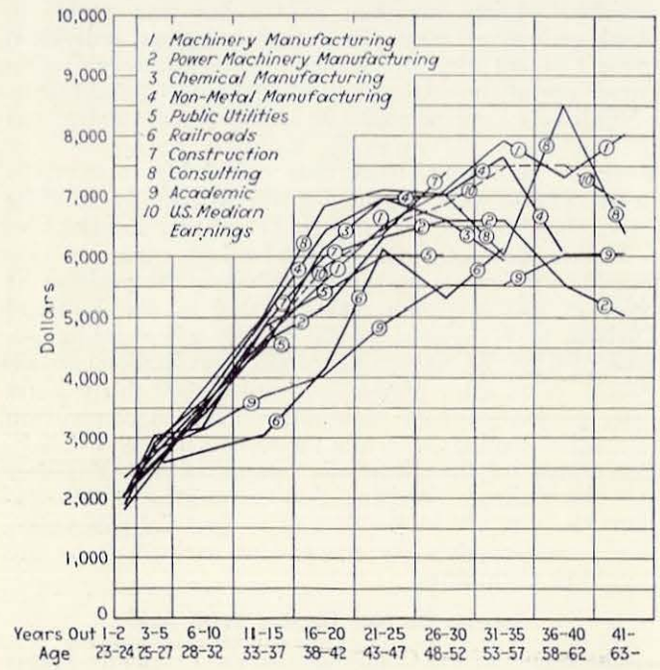
The report of the Committee on the Economic Status of the Engineer states that engineering earnings do not decline seriously with age. Median earnings of men



Comparison of 1930 Median Earnings of Mechanical Engineers by Geographical Location

over 63 years of age practically equal those of men 48 to 52 years old. The lower boundary of the top ten per cent is as high at 63 years of age as it was from 53 to 57. Even the upper boundary of the lowest ten per cent, where the peak is reached at from 43 to 47 years, does not decline after 63 to substantially less than it was at from 33 to 37.

The maximum earnings at the upper boundary of men in the lowest ten per cent, it was pointed out, are earned by men between 43 and 47 years old; the maximum earnings at the lower boundary of the top ten per cent are earned by men from 58 to 62 years old. From the start, however, although the increase in dollars



Comparison of 1930 Median Earnings of Mechanical Engineers by Type of Industry

per year may be more, earnings at all salary boundaries generally increase at a slower ratio each successive year as men grow older, with a significant turning point in rate of increase between 35 and 40 years of age, as well as at the maximum.

Not only do salaries increase more rapidly in youth, but the rate of spread between the salaries of highly paid and low-paid men is greatest in early years.

What an Engineer Can Do on Median Earnings

If median 1930 earnings are considered as the earnings of the typical engineer, and it is assumed in the report that the typical engineer marries at 26 years of age, and has two children at 30, the balance sheet of earnings and responsibilities on the 1930 basis will be about this: He will have about $2,700 to marry on; when his second child is born he will have about $3,500 with which to support his wife, his two children, and himself. When he is 45 and his two children are entering high school, he will have about $6,500 for his family income.

At the age of 50, 28 years after he himself was graduated from college, the committee estimates, he will have two children in college and earn about $7,000 a year. If he gives each child $1,000 a year for tuition and expenses, he will have $5,000 left to support his wife and himself. At sixty, with his children presumably self-supporting, he and his wife will have $7,500 a year to spend, but must look forward to a decline in earning power to $6,800 after sixty-three.

Report Shows the Best Place to Make Money—No Data As to Expense

The New York Metropolitan district is reported as giving the highest median earnings at all ages below 63, but these are not substantially above earnings in the Middle Atlantic states except for men over 40, or the Middle West, except for men over 50. If the cost of living is taken into account there would probably be but little, if any, differential in favor of New York below that age, the report asserts. How much the sharp increase in earnings in New York City for men in the fifties is due to the calling to this city of leading men from other areas, it is impossible to determine.

In the Middle West, median earnings are slightly above the United States median until 50, after which there is a striking decline in earning power. The Middle Atlantic states, according to the report, fall behind the median of the United States at 40, but practically catch up at 55, and are well above the United States median at 65, although at the higher salary boundaries earnings remain low. Between 35 and 55 years of age, New England earnings are approximately $500 less than the median of the United States as a whole. After 60 they are nearly $800 less.

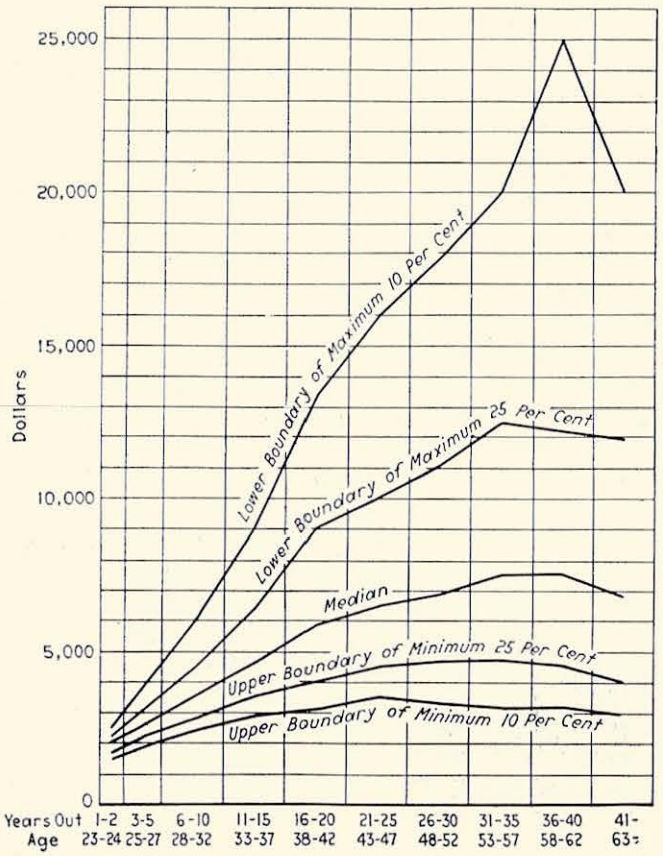
In the South, it is stated, young men under 35 earn well, but thereafter median salaries are consistently low, averaging over $1,000 below the United States median, but salaries at the higher boundaries are not below the country as a whole, even for men in their forties.

In the Prairie, Mountain, and Pacific states earnings are distinctly the lowest at all ages, except for salaries in the Pacific states for men between 38 and 42, who earn a little above the United States median, and salaries in the Prairie and Mountain states between 48 and 52, which equal those of the South.

A comparison of the data for type of job, shown in the report, with those of different industries indicates that while academic institutions pay less than almost any other class of employers, the earnings of teachers com-

pare favorably with the earnings in the technical branches of engineering. It also indicates that the differences between types of industries are relatively small compared with the differences between types of work. Apart from teaching and railroads, it is pointed out, it makes relatively little difference what industry a man goes into. There is little question that the highest salaries in the design and technical operation groups themselves, the report states, are received by men whose work is largely of an executive nature, such as vice-president in charge of design and chief engineers.

The survey committee concluded that a good education is "worth while," stating that, apart from railroads and academic institutions, the differences between


25,000
20,000
15,000
10,000
5,000
0
Dollars
Lower Boundary of Maximum 10 Per Cent
Lower Boundary of Maximum 25 Per Cent
Median
Upper Boundary of Minimum 25 Per Cent
Upper Boundary of Minimum 10 Per Cent
Years Out 1-2 3-5 6-10 11-15 16-20 21-25 26-30 31-35 36-40 41-
Age 23-24 25-27 28-32 33-37 38-42 43-47 48-52 53-57 58-62 63+

Earnings of Mechanical Engineers During 1930 for the United States as a Whole—Exclusive of Salaries of Teachers and Federal Employees

industries as regards salary opportunities are not great at most ages.

The differences in earning power between men whose work is exclusively technical and those who combine with their technical ability the capacity to handle independent businesses or to manage men or affairs, are great—so great as to indicate the importance of most engineers' seeking to develop themselves in this respect, and of engineering schools' bending their curricula somewhat toward this end.

The report was signed by Conrad N. Lauer, (chairman) president, Philadelphia Gas Works, Philadelphia, Pa.; C. F. Hirshfeld, chief of the research department, Detroit Edison Company, Detroit, Mich.; Dexter S. Kimball, dean of the College of Engineering, Cornell University; Henry B. Oatley, vice-president in charge of engineering, Superheater Company, New York; Col. William A. Starrett, president, Starrett Corporation, New York; Herbert L. Whittemore, chief of the Engineering Mechanics Section, Bureau of Standards, Washington, D. C.; William Elgin Wickenden, president of the Case School of Applied Science, Cleveland, Ohio, and James M. Todd, consulting engineer, New Orleans, La.

Government Investment in Railway Bonds Proposed

(Continued from page 328)

carriers, that the increase would ruin many California industries and that a great amount of produce, especially fruit, would remain unharvested.

Edwin G. Sutherland, professor of economics and sociology of the University of Nevada, contended that the railroads are the most important unit in our industrial machine and that the federal government should come to their assistance with aid where needed. As an indicator of the general business depression he incidentally cited the price of copper in 1913 as 15-7/10c per lb. as compared with 7-7/8c per lb. in 1931. In his attitude toward the railroads he was supported by J. F. Shaughnessy, chairman of the public service commission of Nevada, who proposed the creation of a federal railway loan bank to assist in re-financing the railroads, a plan comparable to the federal farm loan program.

Under this plan the rate increase would be denied; Congress would be asked by the commission to give immediate attention to the plight of the railroads; Congress would establish a loan bank and take over railway bonds outstanding at interest rates from 4 to 7 per cent, and re-issue the securities at not more than 4 per cent, and then prevent further excessive expenditures on equipment and borrowing at high rates of interest. The re-issuance of bonds, he declared, would save the railways $200,000,000 a year.

"There should be created a revolving fund," he continued, "and to the extent that there is amortization and issuance of bonds, equipment trusts and short term notes, the government should become an owner in the proportion which its investment bears to the total. It should have a voice in questions relating to the necessity and extent of additions and betterments, to the end that its equity may be safeguarded."

George K. York of the Federal-State Market Service and supervisor of the Market Information Service of the Department of Agriculture of the University of California declared that California was the most important shipping state in the union due to two factors, that of quantity and that of distance hauling. In support of this he contended that more than 300,000 carloads of perishable goods alone move over the transcontinental railroads to the east every year. In analyzing the condition of California growers he testified that the average price of fruits received by California growers in eastern markets had decreased from $8.84 per hundred pounds in 1920 to $4.12 in 1930.

Chester B. Moore, manager of the Western Growers' Protective Association, testified that an increase in freight rates would divert traffic from the railways. "If the increase in rail rates is allowed," he said, "it will force us to divert a large amount of our business to trucks, and force still others of us out of business entirely. At present with the development of high speed, refrigerated trucks, with the increasing use of dry ice, we are shipping by truck to Utah, Wyoming, Oregon and Washington." He said that the $55,000,000 or $65,-

000,000 freight charges paid by his organization which grows and ships approximately 130,000 carloads of vegetables and melons a year would be increased about $8,000,000 if the 15 per cent increase were granted. *Threats* of diversion to water and truck lines were also made by such witnesses as C. O. Cornwell, traffic manager of the California Fruit Growers' Association and director of the California Citrus League and Frank H. Buck of the California Growers Shippers and Protective League. Mr. Cornwell declared that the bulk of the orange and lemon crop will be shipped by water, if the proposed increase is granted.

"We can ship by water to New York now, and ship back as far west as Chicago by rail, at a saving of $111 per car when the increase is placed in effect," he said. He also testified that there are 10 principal steamship lines owning 104 boats with refrigeration facilities, operating between Los Angeles and New York by way of the Panama Canal and this constitutes a capacity of 925,118 boxes of oranges per week, which is one-half of the orange crop. He declared that his industry is not particularly in favor of water transportation, prefering rail service, but with a differential of $295 per car under the proposed rates to New York, it will be driven to the adoption of water transportation.

Evidence was presented to show that with small profits or losses, growers refuse to harvest their crops. Frank T. Swett, manager of the California Pear Growers Association said that there are 78,000 acres in pears in California today, but that many orchards have changed hands because of foreclosures and that the cost of production and marketing was greater during the last few years than receipts. W. G. Ellis, president of the Federal Land Bank at Berkeley, Cal., stated that there are three times as many delinquent bank loans on agricultural lands outstanding at present as at any time in history. On July 31, 1931 the delinquencies totaled $3,267,000.

Albert G. Mott, chief engineer for the State Railroad Commission of California, said that 80,000,000 lb. of grapes were sold in New York last year for less than the cost to the growers. Several other shippers testified as to the condition of agriculture in California, showing that in many cases the farms are operated at a loss.

Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading in the week ended August 15 amounted to 742,736 cars, an increase of 7,756 cars as compared with the week before, but a decrease of 180,087 cars as compared with the corresponding week of last year and of 359,831 cars as compared with 1929. The summary, as compiled by the Car Service Division of the American Railway Association, follows:

Revenue Freight Car Loading

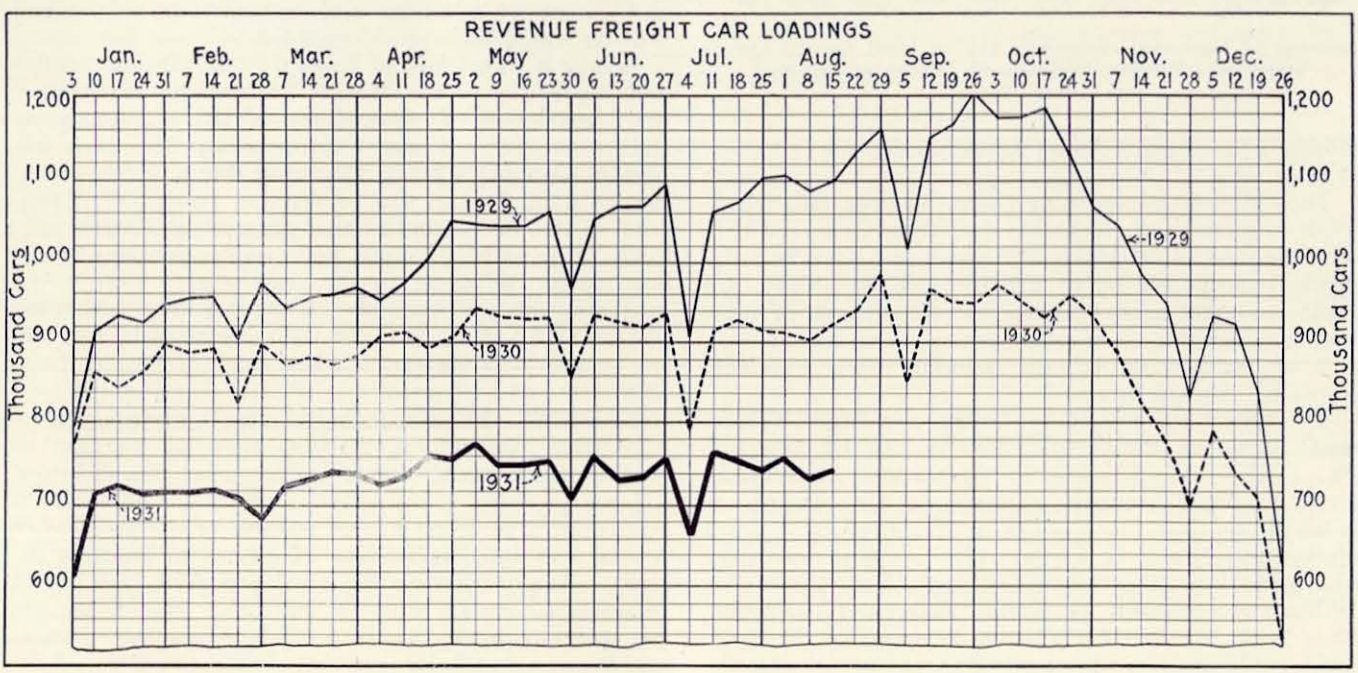
Week Ended Saturday, August 15, 1931

Districts	1931	1930	1929
Eastern	164,187	202,065	247,157
Allegheny	140,431	184,296	223,967
Pocahontas	46,149	54,041	62,733
Southern	103,212	120,030	144,774
Northwestern	106,480	152,757	180,630
Central Western	115,595	136,843	157,713
Southwestern	66,682	72,791	85,593
Total West. Dists.	288,757	362,391	423,936
Total All Roads	742,736	922,823	1,102,567
Commodities			
Grain and Grain Products	46,017	62,312	61,511
Live Stock	20,280	21,200	24,664
Coal	112,817	137,668	159,953
Coke	4,623	8,415	11,685
Forest Products	27,819	40,803	68,018
Ore	35,303	57,633	74,574
Mdse. L.C.L.	212,770	234,091	260,085
Miscellaneous	283,107	360,701	442,077
August 15	742,736	922,823	1,102,567
August 8	734,780	904,157	1,092,153
August 1	757,293	919,781	1,105,920
July 25	741,752	919,301	1,102,553
July 18	757,555	928,271	1,079,968
Cumulative totals, 33 weeks	24,145,560	29,502,947	33,077,671

Car Loading in Canada

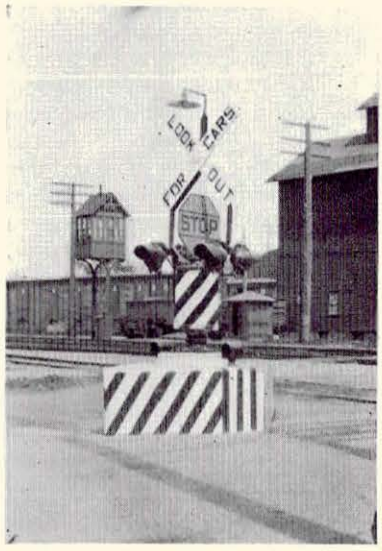
Revenue car loadings in Canada for the week ended August 15 totaled 47,598 an increase of 2,701 over the preceding week, but a decrease of 14,352 when compared with the same week in 1930.

	Total Cars Loaded	Total Cars Rec'd from Connections
Total for Canada		
August 15, 1931	47,598	21,566
August 8, 1931	44,897	22,144
August 1, 1931	45,993	22,494
August 16, 1930	61,950	29,181
Cumulative Totals for Canada		
August 15, 1931	1,582,322	875,527
August 16, 1930	1,948,670	1,120,911
August 17, 1929	2,189,948	1,372,543

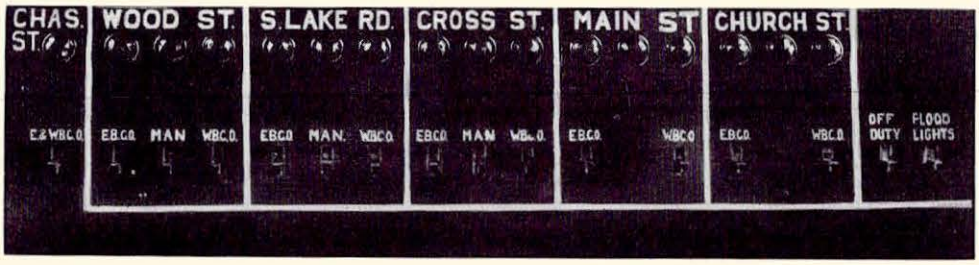


Crossing Protection Signals On The Milwaukee

Order type of protection replaced by flashing-light type with rotating stop disk



Side of Street Signal Location on South Cross Street



Center of Street Signal Location on Silver Lake Road

The Switches and Indication Lights Are Arranged on the Front of the Operator's Panel

DURING the last few years, the Chicago, Milwaukee, St. Paul & Pacific has followed an active program of improving the highway crossing protection on its line. In 1927, the first signals of the flashing-light type with rotating stop disk were installed in Minneapolis, Minn.; later 100 signals were installed to protect 51 grade crossings in St. Paul and Minneapolis. The results derived in reducing the number of accidents, expediting street traffic and reducing operating expenses led to the adoption of this type of signal as standard for the road. Older types of protection have since been replaced and new installations have been made until about 334 of these signals are now in service for the protection of 166 crossings on the Milwaukee lines east of Mobridge, S. D. Conditions differ considerably at various locations but the improvements completed recently at Oconomowoc, Wis., are typical and will be described in detail.

Operating Conditions

Oconomowoc is a town of about 3,500 population with several small industries such as a milk condensory, mills, etc. Being located in the lake region of Wisconsin, the travel on the streets is increased materially in the summer months. The double-track main line between Chicago and St. Paul passes through the residential section of Oconomowoc, with spurs to several industries, house tracks and coal yards. Two passing tracks, one for eastbound and another for westbound trains, extend from a point about 1,770 ft. east of the station for about 4,300 ft. The traffic includes 22 passenger trains and about 12 freight trains daily. Thirteen of the passenger trains stop at Oconomowoc but none of the through freights are scheduled to stop. Local freight trains, which are scheduled west through Oconomowoc about 8 a.m. and east about 12:30 p.m., usually switch for 30 to 45 min. while serving industries in the town. In addition, a patrol run ties up at Oconomowoc and also does switching for some of the industries.

Previous Protection

Pneumatically-operated crossing gates were formerly in service at five street crossings. The gates at Summit road and Main, Second and South Cross streets were controlled from a tower located centrally. As Main street crosses the tracks at an angle, and as Summit and Second streets join Main street at the railroad, the gates had to be so long as to be very difficult to operate and maintain. The gates at these streets were in service 24 hr. every day. At Silver Lake road, the gates were operated during the period from 7 a.m. to 11 p.m. by the man who also operated the water pumping station nearby. Two wig-wags, with a bell, controlled automatically and under manual control of the pumpman were also in service at this crossing. At Concord street, a wig-wag with a bell was controlled automatically, and a flagman was on duty from 6 a.m. to 6 p.m. At Wood street, a flagman was on duty from 7 a.m. to 7 p.m. Thus a total of nine men were employed as pumpmen, gatemen and flagmen.

The lack of uniformity of the protection afforded at different crossings was objectionable, with gates in service full time at some crossings, with gates part time and wig-wags and bells or flagmen at other crossings. The operation of the gates was slow, thus delaying street traffic unnecessarily. The division superintendent and the signal supervisor of the Milwaukee conferred with the city council of Oconomowoc in an effort to develop uniform full-time protection at all the crossings in the city. Members of the council inspected installations of the duplex flashing-light signal with rotating stop disk in nearby towns and, after a thorough investigation, passed an ordinance authorizing the Milwaukee to install the rotating stop-sign type of signals in place of the gates, wig-wags, bells and flagmen formerly in service at the six crossings, and required that in addition to automatic track circuit control, an auxiliary manual system of control be used to prevent unnecessary operation of the signals when trains were switching or stopped at the station.

New Signals Installed

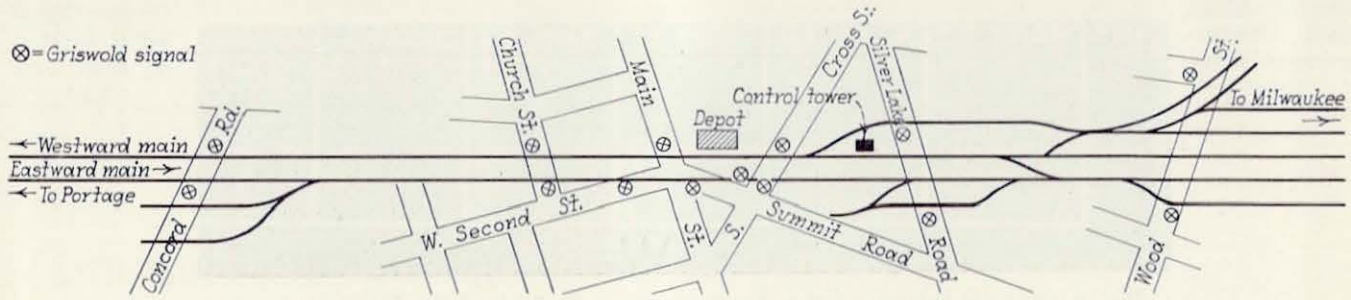
A new rotary-type pump, operated by an electric motor controlled by a float switch, was installed to replace the old steam pumping plant, thus dispensing with the need for a pumpman. Two rotating stop signals, with regular flashing lights, were installed at each of the crossings at Concord, Wood, Silver Lake, South Cross and Church streets, and four such signals were required at the combination crossing of Main, West Second and Summit streets. Thus a total of 14 signals were installed.

The principal feature of this type of signal is the stop sign, which shows the word Stop in black letters on a yellow field with a black border, constructed according to the standards of the National Conference on Street and Highway Safety, which has been adopted by most of the states as the official stop signal for highway and street traffic. In the construction of the signal, the stop sign is attached to a vertical shaft operated by an electric motor. The mechanism operates to clear the signal, i.e., turn the edge toward the approaching highway traffic. When a train approaches, the mechanism is released and the sign turns by force of gravity so as to present the word stop to the view of approaching street traffic and at the same time, the regular red lights on either side flash alternately. Fifty-watt, 110-volt bulbs are used in these flashing-lamp units and each signal is equipped with four lights, two to shine in each direction. A floodlight, equipped with a 25-watt lamp, illuminates the crossbuck, "Railroad Crossing," sign continuously during the hours of darkness, this circuit being controlled by a snap switch in the watchman's tower. A second lighting unit, equipped with a 25-watt lamp, illuminates the stop sign only when it is turned toward street traffic. This signal is said to conform with the new requisites for highway crossing signals adopted by the Joint Committee on Highway Crossing Protection of the American Railway Association, with the possible exception that these requisites state that the lettering of the stop sign is to be red, whereas the lettering is black on the disk of the signals being used on the Milwaukee.

Control of Signals

The track circuits are so arranged that the sign is turned and the flashing lights operate the usual twenty seconds before the arrival of the train at each crossing. This track circuit control is effective for trains moving in either direction on each main track. The switching of the local freight and the operation of the passenger trains which stop at Oconomowoc, are included in the period from 8 a.m. to 7 p.m., during which period, a man is on duty in an elevated tower near Silver Lake street. Mounted in this tower is a sheet-metal control cabinet with small levers which actuate enclosed knife-switches for controlling the signals. A set of indication lights is provided for each crossing. For example, when an eastbound train approaches, the several signals start operation through the automatic track circuit control arrangement. A green lamp on the watchman's panel flashes as soon as the corresponding signal starts to operate. If the train stops at the station, the watchman operates a lever which clears the signal at Silver Lake street. When he operates this cut-out lever, the corresponding green light is extinguished and a red light immediately above the switch is illuminated as a warning that he has cut out the automatic control. This cut-out is effective for only the one direction of the one track. If a train approaches on the westbound track, the signal will operate automatically, independent of the fact that the watchman cut it out for the eastbound track. When he sees that the train is ready to start, the operator returns the levers to the normal position and the signals operate through the automatic track circuit control, thus warning street traffic of the approaching train. The same method of control is used when the local freight is switched on the main tracks.

However, when a train is on the passing track or when the local is operating on an industrial track, which tracks are not equipped with track circuits, the tower man watches the train and operates the signals in time to provide warning. In such cases, his control is directly manual, no automatic features being involved. A separate switch is provided for this manual control feature for each of the crossings where non-track-circuited tracks are involved. The green light above each set of levers flashes when the signal is at stop, and this serves as a reminder to the watchman to clear the



Track and Signal Plan of Crossing Protection at Oconomowoc, Wis.

signal as soon as the train passes the corresponding street.

Satisfactory Results

By installing these new signals in place of the previous equipment and flagmen, the Milwaukee has provided uniformly dependable protection at its crossings which has been a success in reducing the number of accidents. The city council and the public seem to be well pleased with the improvement. The annual reduction in operating expenses represents a return of about 36 per cent on the cost of the improvements, including the signals and the new electric pump.

The signals and the control machine were furnished by the Griswold Signal Company, Minneapolis, Minn., and were installed by the signal department forces of the Milwaukee road.

Electric Tiering Truck

COMPARATIVELY light, but bulky objects, usually require large areas for storage. This condition demands the utmost utilization of every inch of both floor space and head room that is available, with the result that aisles are frequently narrow and congested. As a result, there has been a demand for a medium duty electric industrial truck to operate, transport and tier in very limited space. To meet this demand, The Elwell-Parker Electric Company, Cleveland, Ohio, has designed a new model specially suited for operation in close quarters.

This truck is a three-wheeled machine, steering with a third wheel, so that it turns practically within its own length. Short turning is further aided by tilting the uprights, which brings the load back over the main portion of the truck. This inclined position of the load provides safety for high speed travel, since the load is retained in the inclined position. High travel speed is an important factor in a truck of this character, because the loads are not extremely heavy, usually weighing from 500 to 2,500 lb. Another important feature of this truck is that it will travel through factory, storage, or freight-car doorways seven feet in height and likewise go beneath piping and mezzanine floors having the same clearance.

Elwell-Parker Tiering Truck for Work in Close Quarters

When the truck emerges into spaces with head room greater than seven feet, the telescoping feature of the upright provides for the double extension of these uprights, so that the forks supporting the load can travel to an upper limit of 96. in. This feature permits the stacking of one load on top of two loads, with the result that all head room in the warehouse up to the height of three loads is fully used. The forks may or may not be provided with a back rest, depending upon the character of the goods to be handled.

Comfort for the operator, together with ease of operation have been amply provided for. All movements are within operator's control without leaving the pedals. Controllers for travel, hoist, and tilting are immediately in front of him. An unusual feature is the provision of a rubber-padded back rest, so that the operator has a back support at all times.

All of the usual Elwell-Parker standard safety features have been incorporated in this truck. This machine fills a need of many users of bulky commodities, which are frequently handled and rehandled. Boxes, barrels, bales, bundles, always require much time in being moved in and out of storage. With this new truck, a high platform skid is not required, since the forks need only a two-inch clearance beneath the bottom of the load.

Washington Rate Hearing

WASHINGTON, D. C.

THE Washington hearing before Commissioners Meyer and Porter of the Interstate Commerce Commission in the 15 per cent general rate case was concluded on August 20 and an adjournment was taken to Chicago where two and possibly three hearings will be held at the same time beginning on August 31. At the Chicago hearings, which are expected to run for a week or ten days, the railroad and financial witnesses who testified at the first hearing will be cross-examined and an opportunity will be afforded for additional testimony by shippers and any railroad rebuttal.

Representatives of coal operators in various eastern groups testified on August 20, most of them in opposition to any increase in coal rates, although H. L. Findlay, for the eastern Ohio operators, seemed most concerned about the differential on lake cargo coal. He said the Ohio operators expressed no opposition to the rate advance if the commission should find it warranted but desired that any increase allowed should be on a straight percentage basis, whereas the railroads had proposed in the case of coal to maintain existing differentials in cents per ton. For the lake cargo coal they had proposed to add 26 cents per ton, 15 per cent of the average rate, which Mr. Findlay said would increase the rate from the Ohio districts from $1.43 to $1.69, or 18 per cent, while that from the southern fields would be increased only from $1.81 to $2.07, or 14 per cent. He contended that the roads would get less additional revenue if the business should be diverted to southern fields and that the northern district roads are more in need of financial relief than those serving the southern fields.

C. B. Ackerman, a freight traffic analyst, submitted exhibits showing the history of the lake cargo rates in support of the argument for a uniform percentage advance. W. A. Jones, secretary of the Central Pennsylvania Coal Operators' Association, also objected to the method proposed for maintaining differentials and he said that an increase in coal rates would tend to increase the use of substitutes for coal fuel which have already caused a decrease in the production of bituminous coal in the United States from 478 million tons in 1913 to 461 million tons in 1930. He asked that if any increase be allowed it be made temporary.

C. C. Dickinson, of Charleston, W. V., representing southern district operators, emphasized the effect on unemployment of increasing the use of substitutes for coal, such as oil, gas or electricity, which he said would follow any increase in coal rates. He said that after the first investment has been made for hydro-electric power or a pipe-line the number of employees required is less than if coal were used and that the consumer pays more for fuel in the form of interest and less in the form of wages. O. L. Alexander, vice-president of the Pocahontas Fuel Company, said that any increase in coal rates will disturb commercial relations and add to the existing confusion in business generally while adding immensely to the burdens of the "already overburdened" coal industry. "We are not merely asking that you do not further handicap us in trying to help ourselves," said Mr. Alexander. "We are advising you very definitely that to increase coal rates will not increase railroad revenues. If there be an emergency and you attempt to solve it by increasing freight rates on the traffic that the railroads now enjoy from the coal industry, it will come to be known as Emergency No. 1. The loss of traffic that will follow will create another emergency, perhaps to be called Emergency No. 2, to be followed possibly by Emergency No. 3, if it takes that much experience to demonstrate the mistake of the railroads in trying to cure their troubles by rate increases. The railroads must realize that their continued failure to assist the coal industry and their willingness to even put additional burdens on it will force it to devise ways and means of providing substitute transportation for their products."

An exception from any general advance so that present rates may be maintained on materials entering into unexpired public contracts awarded on a fixed price basis was asked by Frank S. Carr, representing the National Contractors' Protective Association.

Frank Carnahan, traffic manager of the Northeastern Retail Lumber Association, opposed any increase in rates on lumber, saying that under present conditions he did not see how an advance could possibly be applied to this traffic. No other part of the country, he said, will show as great a diversion of traffic from the railroads to competitive forms of transportation as will result in the East if the carriers persist in increasing their lumber rates.

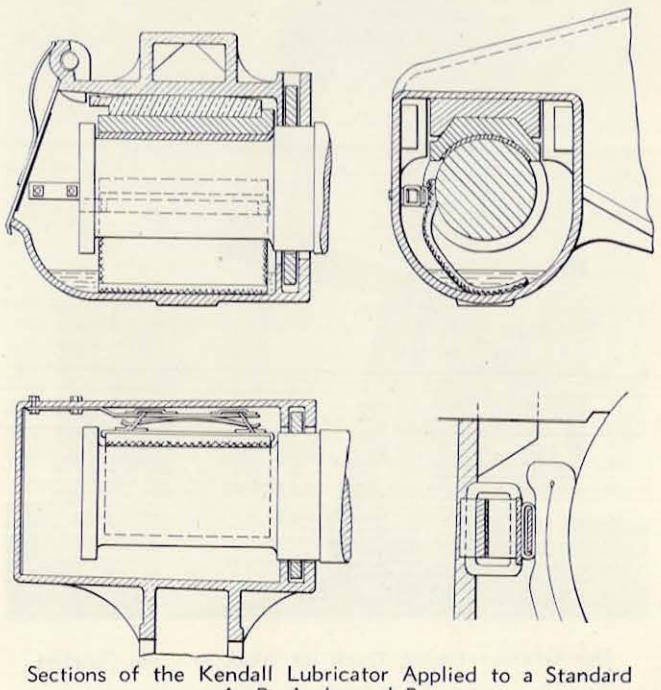
Sidney W. May, chairman of a committee of the New York State Travellers' Association, protested against any rate increase in the name of "the customers of the railroads engaged in overcoming sales resistance that stimulates the flow of freight". "We know," he said, "that our function will be greatly handicapped if an increase in freight rates must be added to the cost of the merchandise we sell. If the railroads executives had any vision or merchandising knowledge they would realize that the proposed increase will kill the goose that lays the golden eggs."

The Southwestern Industrial Traffic League and the Texas Industrial Traffic League have petitioned the commission to rescind its ruling that evidence as to railroad wages will not be received in this proceeding. They asked the commission to consider not only the wages of employees but also the salaries of officers and to permit the introduction of testimony bearing on them.

Kendall Journal Lubricator

THE Kendall journal lubricator, illustrated, has been developed by the Railway Products Company, 5949 W. Superior street, Chicago, and tested during the past two years in both passenger and freight service. Experimental applications have also been made to provide lubrication for locomotive main driving journals, the performance record generally indicating a high degree of reliability and improved lubrication with about one-third of the ordinary oil consumption.

The lubricator consists of a specially-woven cotton pad, approximately as wide as the journal and ⅜ in. thick, supported by spring tension against the journal at the level of the center line and long enough to extend down to the bottom of the journal box which forms a reservoir for a small amount of car oil, fed by capillary attraction to the journal, as needed for lubrication. All of the materials entering into the construction of this lubricator are relatively inexpensive to procure and the device can be quickly and easily applied to the interior of any standard journal box. The lubricating pad is secured to a brass strip which is in turn locked to a pressure bar, flexibly spring supported from another small bar rigidly held in the journal box by two small bolts. The connection is sufficiently flexible to allow the lubricating pad to follow any normal end movement of the journal in the box and it does not interfere in any way with jacking the box for the examination or renewal of brasses. This type of construction is designed to do away with the possibility of "waste grabs" and provide an effective supply of lubricant to the journal at small expense for initial application and with substantially less subsequent inspection and attention to assure freedom from hot boxes than would be the case with oil and waste packing



Sections of the Kendall Lubricator Applied to a Standard A. R. A. Journal Box

ordinarily used in standard American Railway Association journal boxes.

The Kendall journal lubricator is now in test service on 10 roads, the original installation having made over 240,000 miles since first being placed in through passenger-coach service in June, 1929. Experience with these tests is said to have indicated an entire freedom from failure due to "glazing," the presence of dirt, water, snow or ice in the box, or the accumulation of lint working under the brass to cause a hot box. Terminal attention to these lubricators has been minimized and confined to the application of a small amount of oil at infrequent intervals. One road reports 2,000 miles per pint of oil per box; another reports 100,000 miles on 26.36 pints of oil, or about 3,800 miles per pint per box. A third road, however, which installed eight test boxes on a passenger car in April, 1931, reports that the car made 10,098 miles in the next three months without the addition of any extra oil. Kendall lubricators which had previously been in service for a year and covered more than 100,000 miles were applied to four journal boxes and sealed during a 30-day test, in which an oil consumption of .01687 ounces per mile per journal was reported, as compared with .05968 ounces per mile per journal for an A. R. A. packed bearing, or a saving of 72 per cent in oil alone.

Great Northern Asks To Be Relieved of A. T. C. Order

COMMISSIONER Frank McManamy of the Interstate Commerce Commission will conduct a hearing at St. Paul, Minn., on September 3 on a petition filed with the commission by the Great Northern for authority to discontinue further maintenance and operation of the automatic train-stop and train control devices on its line betweet New Rockford and Williston, N. D., 229.3 miles, and for an order vacating, insofar as they pertain to the Great Northern, the commission's orders of 1922 and 1924, as amended.

The petition, signed by C. O. Jenks, vice-president in charge of operation, shows that the cost of maintenance and operation of the automatic train-control for 1928, 1929 and 1930 amounted to $26,954 for roadway and $27,564 for locomotives, a total of $54,518, or an average of $18,172 per year or $1,514 per month. It was manufactured by the Sprague Safety Control & Signal Corporation at a cost of $368,992, including installation. It is stated that the character of the railroad between these points is such as not to reasonably require the maintenance of automatic train-stop and train-control devices; that the company's record for safety indicates that they are not reasonably necessary on any part of its lines, and that a much greater return for money which it will be required in the future to spend for maintaining the devices can be realized in the way of safety to passengers and employees and protection of property by equipping additional portions of the railroad with the automatic block system, by eliminating dangerous grade crossings with highways, by making improvements and betterments such as the construction of additional main track, passing tracks, reduction of grades and curves, replacing wooden bridges and trestles with steel or concrete, and installing heavier rail, and that such improvements will not only contribute in a greater degree to safety but will also provide for more efficient operation.

The installation between Minot and Williston was put into service on November 1, 1925, under the order of 1922, and that between New Rockford and Minot on July 18, 1926, under the order of 1924. On the district between Minot and Williston the train-control equipment is superimposed upon an automatic signal system using three-position semaphore signals operated under the A.P.B. plan of control, and on the district between New Rockford and Minot it is superimposed upon an automatic signal system using colored light type of signal operating under the overlap plan of control. Train-control equipment is maintained on 73 locomotives and three gas-electric cars.

It is stated in the petition that the territory on which the devices were installed is one of light traffic density; that the number of passengers carried on the Great Northern decreased from 8,168,937 in 1916 to 1,694,437 in 1930, and that the trend has continued downward; that the reduction in passenger-train-miles on the system for 1931 will amount to almost 20 per cent below the figures for 1930. It is also stated that while during 1930 the number of collisions per million locomotive miles run on all railroads of the United States having total locomotive miles of 20,000,000 or more ranged from 0.60 to 3.84, the Great Northern had 1.43 collisions per million locomotive miles, the tenth lowest of the railroads mentioned. During that year the Great Northern had only two collisions on main line track which automatic train-control is installed to prevent, both of which accidents occurred in territory not equipped with automatic block signals. In these collisions no employees were injured. Six passengers and one person riding on contract claimed injuries. Since September 19, 1919, no passenger has been killed on this railroad in a train accident as defined by the commission.

Cost of maintaining and operating the devices is not confined to the expense referred to, the petition says. Reassignment of locomotives and the adoption of longer engine runs are seriously interfered with through the necessity of operating only train-control equipped engines between New Rockford and Williston and the maintenance of the devices also interferes with the natural and economical operation of the railroad. For the years 1920 to 1930 the company has expended for maintenance and operation of signals and interlackers on its system $6,915,948 but 5,555 miles of main and branch line track are not yet equipped with automatic block signals.

For example it is stated that the $1,500 per month expended for maintaining the devices would more than equip a dangerous highway crossing with the most efficient automatic signal protection "and one such crossing so equipped each month would go far toward reducing the number of collisions between trains and automobiles at public crossings which are a constant hazard to both persons using the highway and to passengers and employees on trains."

One point made in the petition is that from 1921 to 1930 the Great Northern has failed of making a 5¾ per cent return on the commission's valuation plus additions and betterments by a total of $58,263,331.

In conclusion it is stated that "of the railroads now maintaining automatic train-stop and train-control devices petitioner is the last in the order of traffic density in the territory protected by these devices of any railroad in the country with the exception of a subsidiary of the Southern Railway. While train-stop and train-control devices may be justified on certain railroads under certain conditions, they are not justified under the conditions which obtain on petitioner's railroad."

Communications . . .

Says Rails Lag in Speed, Comfort and Merchandising Methods

CINCINNATI, OHIO.

TO THE EDITOR:

With all the talk about the plight of the railroads, some things seem to be generally overlooked, to wit: Although efficiency has been greatly improved, has speed? My father, a manufacturer of a product used by grocers, ships all over the Middle West, East and South, by truck, because, not only it is cheaper, but it is as fast; and his customers (independent and chain store alike) request this mode of transportation. Startling is the fact that he ships by barge from Cincinnati to Louisville as fast, and much cheaper, than he can by railroad; it only takes overnight.

Lately I returned from the West. The so-called "crack trains" are a joke. Sixty-one hours of unbearable heat and unimaginable filth on one of them. Another of a rival line was no better, though slightly faster. The food was expensive and not half as good as the table d hote meals on the European trains. I paid over eighty dollars for a stateroom, when for a delightful double room, beautifully furnished, I paid eighty dollars for a week-end cruise on the *Berengaria*, which included fine food, etc. On the coast a renowned train, but drab and uncomfortable, took three hours for a trip between two cities. Comfortable buses make the same time and are clean and cool. I drove it in a light automobile in two hours.

From a point in Michigan which I visit to Cincinnati a train runs almost empty in about seventeen hours. I regularly drive that distance in twelve or fourteen. Has the train any right to be full?

Look at the change in motor cars in four years! In airplanes! In buses! Even in trucks or steamships. My 1929 automobile is today as outmoded as a locomotive of 1890. I, at twenty-two, can not remember when railroad cars looked any different. Yes, brown and green linoleum supplants that of red and green in Pullman passageways and brown lacquer has come in. But the cars are still black, dirty and uncomfortable compared to an airplane or bus seat. Everyone notice the beauty of new boats, automobiles and airplanes—yes, and even of new trams or buses, but rolling stock to the layman is a symbol of ungainliness and soot.

The railroads have not created something for the masses to tangibly marvel at any more. Even small boys, today, formerly devotees of "choo-choos," are worshipping airplanes, buses or motor cars.

Thus I say, not only must unfair competition be abolished, but the railroads must progress. They must get people to talk about their product as we daily marvel at a new ocean liner or a new design of automobile. They must supply speed, as they once did in the nineteenth century. They must create and publicize consumer interest as the shipping lines do.

What are the artists, designers and research men of the railroads doing? The locomotive builder must get a Kettering. The passenger car builder needs a Norman Bel-Geddes.

I have written this letter as the expression of the opinions of my friends and even conductors and brakemen. I should like to find out what is being done. Are the railroads keeping up with the times, or must I keep my promise along with five others never to take a train West again—when, irked beyond control, my wife and I hopped off a train in Wyoming, and flew, comfortably and coolly, to Chicago in less than twelve hours?

EDGAR J. MACK, JR.

AN AVERAGE OF 4.3 PER MILLION MAN HOURS is the record of casualties to employees reported by the Pennsylvania Railroad for the first six months of 1931, the lowest half-yearly record ever achieved. This is about 33 per cent below the record for 1930. For the month of June, six divisions of the road reported perfect safety records.

Odds and Ends . . .

There's Gold in Them Thar Yards

The yards of the Denver & Rio Grande Western near Salida, Colo., are going to be the scene of a clean-up, in more ways than one. For years, during the gold-mining era, steam shovels worked in these yards transferring ore from narrow-gage to standard-gage cars. Not infrequently some of this ore missed a car and fell alongside the tracks, but no one paid much attention to it at the time. S. T. McKinney, of Albuquerque, N. M., recently strolled through the yards, and saw the heaps of what he immediately decided was "pay dirt". He offered to clean up the dirt and pay the railway 7½ per cent of the net profits. The proposal was accepted.

Believe It or Not

We cannot vouch for this story, but it is at least interesting as a layman's interpretation of the "Economic Theory of Railway Location." A newspaper correspondent in Republic, Kan., wrote the following yarn for the Denver "Post":

"A remarkable twist and circle appears in the Missouri Pacific tracks from Superior, Neb., to Presser. The reason for this crooked track has just been explained. Many years ago, when the contract was awarded for the railroad, the contractors agreed to build a certain number of miles. They found that under the contract they would be forced to build a bridge over the Platte river. This expense had not been computed, and would have caused a heavy loss. So the firm angled the track around sufficiently to fulfill the required number of miles before the river was reached. Now passengers ride several extra miles in circles and twists."

* * *

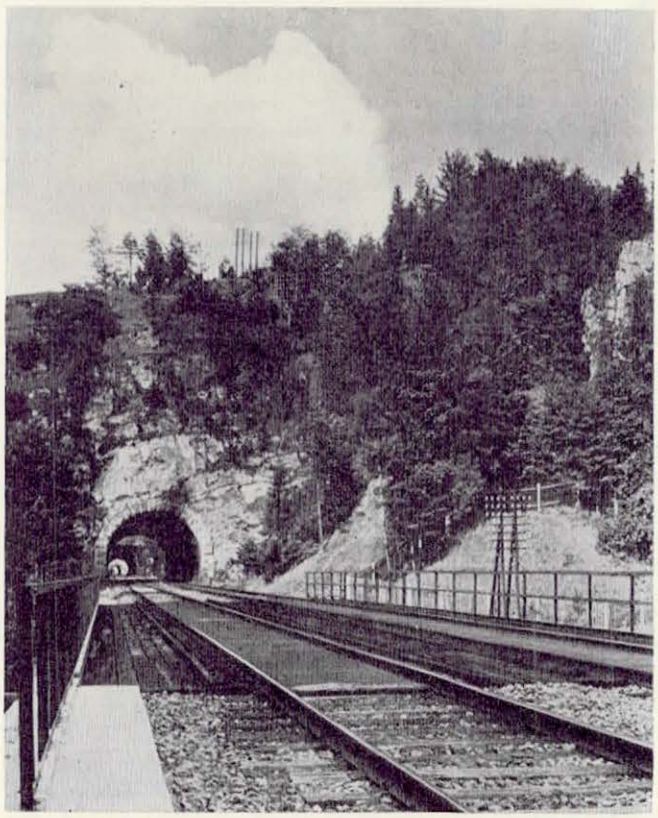


Photo Courtesy German Tourist Information Office

Honeymooners' Paradise

Looking through three tunnels toward a fourth one, on the Bayreuth-Nuernberg line of the German Railways.

News Department Begins on Next Left Hand Page

POWER!...

"Railroading is elementary. All you have to do is increase your ton mileage and keep down your train mileage."

—JAMES J. HILL

The full realization of this vision of economical railroad operation has come with the development of the Super-Power Locomotive.

Be ready with Super-Power Locomotives when business recovers so that it will not be necessary to return obsolete power to service.

For economy, every ton of freight should be hauled by a modern locomotive.

LIMA LOCOMOTIVE WORKS INCORPORATED

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NEWS

Reduction in Short-Haul Iron and Steel Rates Authorized

The Interstate Commerce Commission on August 22, issued a modified fourth section order intended to pave the way toward authorizing the railroads in Trunk Line and Central Freight Association Territory to put into effect their proposed reductions in rates on iron and steel articles for distances of 100 miles and less, to meet truck and water competition, without making corresponding reductions in the rates to intermediate points, subject to certain restrictions. The railroads have been seeking this authority all summer but a previous order issued June 25 contained so many restrictions that they found difficulty in framing tariffs to make the rates effective, and it is reported that meanwhile some of the shippers have got tired of waiting for the reductions and have purchased trucks for short hauls. The reductions were intended to correspond with similar rates prescribed by the Pennsylvania Public Service Commission for intrastate service after the Interstate Commerce Commission, following its investigation under the Hoch-Smith resolution, had prescribed rates for short hauls too high for practical use. Whereas the commission's mileage scale begins at 6 cents for distances of 5 miles or less, the short-haul scale the roads have been seeking to establish begins at 3 cents and ranges up to 16 cents for 100 miles. The modified fourth section order provides that the rates to intermediate points shall not exceed the distance scale rates prescribed or the lowest combination of rates, and that the relief granted shall not include any line or route where the distance is more than 70 per cent greater than the distance over the direct line or route between the competitive points.

"Railroad Pass Racket"

The phrase "Railroad Pass Racket" now being used in press dispatches from Trenton, N. J., refers to alleged abuses in the use of free passes on the railroads of New Jersey which are given out under orders of the legislature. In discussions of a proposition to repeal the law which permits this practice, under which the railroads are required to give these innumerable free rides, have brought out charges that there are a thousand, more or less of office-holders and politicians using these passes. The reference is to persons who apparently are mainly politicians but are classed as office-holders for the purpose of making them eligible to the free rides. It is stated that 104 committees of the legislature have about 450 clerks; and most of the 450 use the passes.

"Few people have any idea of what the rail and traction system mean to the community. I have not been directly connected with any railway since 1918, yet I remember that out of every dollar taken in from seven to fourteen cents went back to the people in taxes, and in the case of the electric lines from $10,000 to $50,000 per mile of line was given to the communities served for pavement which the lines maintained at their own expense, which they never really used themselves but kept clear for the enjoyment of competitive vehicles. Two things stand out in this connection, and a question follows. First, everybody gained by the existence of the rail carriers, electric and steam—the nation, the state, the county, the city, the village, the town and even the school district . . . Secondly, these businesses have been and are being taxed to build roads for the untaxed carriers that have come to deprive them of their business. The question is, who will provide these funds, pay for the city pavements, build and maintain the interurban highways, contribute to the taxes for the education of new generations, when these heavy taxpayers are finally off the rolls?"

—Albert J. Franck in the New York World-Telegram.

Drought Conference Recommends Half Rates

The Western drought conference which was held at Salt Lake City, Utah, on August 17 and 18 recommended that rail rates on livestock and feeds from and to drought-stricken areas be reduced one-half as a means of aiding agriculture and livestock.

Quebec Central Organizes Highway Subsidiary

The Quebec Central has organized a highway subsidiary, the Quebec Central Transportation Company, with powers to operate motor coaches and motor trucks. The first route to be inaugurated will be a motor coach service between Levis, Que., St. George and Morisset. The subsidiary was organized with a view to improving transportation service offered by Quebec Central and at the same time meeting the competition of highway carriers; the highway operations will be confined to the territory served by the parent railroad.

John T. Cochrane Pleads for Equitable Transport Field

Contrasting the plight of the railroads under rigid regulation with the position of the government-owned Inland Waterways Corporation which "can make a rate overnight on any movement or special movement without asking or receiving permission from anyone" and with the situation of the contract truck owners who "can haul a bale of cotton at any price they think necessary to get the cotton," John T. Cochrane, president of the Alabama, Tennessee & Northern, in a recent address before the Rotary Club of Mobile, Ala., pleaded for the creation of a fair field for all transport competitors through the enactment of sound regulatory laws.

Mr. Cochrane's address was a discussion of the present railway situation. He opened with a survey of the railway industry's ramifications pointing out that these are such as to establish the fact that almost every person in the United States is "directly interested in the returns the railroads make." In Mobile, alone, he said, railroad employees were paid $4,732,328 in 1930 and railway taxes in that city amounted to $251,147.70.

Proceeding to a discussion of competing agencies of transport Mr. Cochrane emphasized the need for preserving the railways in a strong condition. He cited specific examples designed to show that these competing agencies could not assume the country's transportation burden and therefore they should not, because of the failure to enact proper legislation, he permitted to take "the cream of the business, leaving the railroads the skim milk or low class freight and only the long haul passenger business.

"These new modes of transportation," he continued, "should not be denied to the people who wish to use them and in cases where users own their own vehicles and pay their normal taxes and use them for their own pleasure or business they should be allowed to do so, but when persons or corporations by the comparatively small investment necessary to furnish a truck or bus sell the service of that truck or bus, and the service made possible by traveling over the highways to another person, then those truck or bus owners should pay for the use of the highway."

The present set-up the speaker found to be "rank discrimination in favor of one class of citizens as against another and it does not help the shipper because the shipper has greater benefit by reason of the Interstate and State commissions regulating charges, and only permitting responsible parties to enter this business."

Continued on Next Left Hand Page

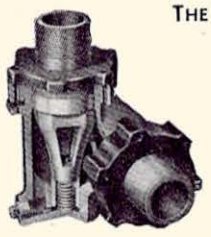
MAINTAIN THE BALANCE OF POWER

High boiler horsepower that will keep a Super-Power locomotive at full speed with a heavy load for hours at a time is useless unless the heavy train can be started.

Also, there is no object in getting a heavy train going if the boiler power needed to move it at high speeds is lacking.

While the Limited Cut-Off produces higher power at speeds, it should be coupled with The Locomotive Booster to maintain the balance between starting power and hauling power.

Working as a team, The Limited Cut-Off and The Locomotive Booster result in well-balanced power that lowers operating costs by producing more ton miles per hour.



THE FRANKLIN SLEEVE JOINT
Does not become rigid under pressures

FRANKLIN RAILWAY SUPPLY COMPANY
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NEW YORK CHICAGO
SAN FRANCISCO ST. LOUIS MONTREAL

"The remedy," Mr. Cochrane concluded, "lies in the practical people of our country realizing and facing the situation as it really is, taking into consideration the investment in railroads, employment of people, sellers of supplies, and their necessity and convenience to the public and joining in a real effort to have the Federal Congress and State Legislatures treat this great industry on which so many people are dependent and in which all are interested, in a fair manner. The way to do this is to pass laws requiring all persons and corporations offering to perform a service as railroads do to be regulated and made responsible to the same authorities and subject to the same penalties as are the railroads."

No Telegraph Section Meeting

The annual session of the Telegraph and Telephone Section, American Railway Association, scheduled to be held at Chicago in September, has been cancelled, according to a recent announcement of J. L. Niesse, chairman.

Toronto Railway Club

The Toronto Railway Club will hold its regular monthly meeting at the Royal York Hotel, Toronto, Ont., on Thursday evening, September 3. J. F. Deasy, vice-president of the Pennsylvania, will speak on co-ordination of rail aid highway transportation.

Frisco Cuts Salaries Five Per Cent

The St. Louis-San Francisco, effective August 20, has reduced by 5 per cent the salaries of supervisory officers receiving $250 to $350 a month and of some employees receiving less than $250 who are not on a five-day week. This reduction is in addition to the reduction of from 5 to 20 per cent which was put in effect last January.

I.C.C. To Investigate Ferry Truck Service

The Interstate Commerce Commission has announced a further hearing in connection with its investigation of container service as to the rates, charges, rules and practices of the Chicago, North Shore & Milwaukee in connection with its ferry truck service between Chicago and Milwaukee. The hearing will be held before Examiner Koch at Chicago on November 3.

G. N. and W. P.'s Right to Build Connecting Link

Judge Curtis D. Wilbur of the United States Circuit Court and Judges Harold Louderback and A. F. St. Sure, of the District Court, sitting enbanc on a constitutional question at San Francisco, Cal. on August 21, upheld the order of the Interstate Commerce Commission granting the Great Northern and the Western Pacific the right to build a 200-mile link to connect the two roads. The order was challenged by the Indian Valley Railroad, which claimed that the proposed connecting link would parallel its tracks for eight miles from Paxton, Cal. to Crescent Mills; and the court was asked to restrain the Western Pacific and the Great Northern from its construction work along this eight-mile stretch; but the judges decided that freedom from competition is a privilege and not a legal right and dismissed the suit.

Railway Men on Relief Committee

R. H. Aishton, president of the American Railway Association, Daniel Willard, president of the Baltimore & Ohio, and Alvanley Johnston, grand chief engineer of the Brotherhood of Locomotive Engineers, have been appointed by President Hoover as members of the advisory committee which is to assist Walter S. Gifford, president of the American Telephone & Telegraph Company, appointed by the President to organize a system of unemployment relief.

I. C. C. Inquires Into Traffic Expenses

In connection with its investigation of practices of railways affecting operating revenues and expenses the Interstate Commerce Commission has addressed to the railways a questionnaire calling for detailed information and explanations of their traffic expenses, which for Class I roads last year amounted to $128,000,000. An accompanying letter emphasizes particularly the question as to the facts pertaining to off-line agencies and the necessity for and purposes of such agencies. Detailed reports are asked for the months of April, May and June, 1931.

Chicago Switching Rates

Members of the Illinois Commerce Commission and of the Public Service Commission of Indiana met at Chicago on August 24 to formulate rulings on the petition of railroads in the Chicago district for authority to make increases in switching rates ranging from 30 to 50 per cent. Increases ranging from 35 per cent upward have been granted the carriers by the Interstate Commerce Commission on interstate traffic and the state bodies will soon file rulings on intrastate shipments, which constitute the larger portion of the traffic.

"Operating Methods Affect Fuel"

As a result of a printer's error, the article by R. A. Black, engineer of transportation, Canadian National, which was published under the title, "Operating Methods Affect Fuel," in the *Railway Age* of August 22, page 280, appeared with two of the accompanying charts transposed. The chart bearing the caption "Fig 2. With Mikado Locomotive on Level Track" on page 280, should have been printed on page 281 with the caption "Fig 4. With Mikado Locomotive on One Per Cent Grade," while the chart indicated as "Fig. 4." should have been numbered as "Fig. 2."

Barge Line Shows Increased Earnings

The Inland Waterways Corporation in the first six months of 1931 had a net income of $114,834, as compared with $75,376 for the corresponding period of 1930, according to statistics made available at its Washington office. The lower Mississippi division showed a decrease as compared with last year but this was more than made up by reductions in the deficits of the upper Mississippi and Warrior divisions and by increased earnings of the Warrior River Terminal Company. For the Mississippi-Warrior service the tonnage handled was 660,013, as compared with 739,247 for the 1930 period; but the Warrior River Terminal Company showed an increase to 217,601 as compared with 204,005 tons in the first half of last year.

Increased Fuel Efficiency

The railroads in the first six months of 1931 established a new record for efficiency in the use of fuel by locomotives, according to reports filed with the Interstate Commerce Commission. An average of 122 lb. of fuel was required to haul 1,000 tons of freight and equipment including locomotive and tender, a distance of one mile. This average was the lowest ever attained for any corresponding period being a reduction of 3 lb. under the best previous record, established in the first half of 1930. In the passenger service an average of 14.8 lb. was required to move each passenger train car one mile, compared with 15 lb. in the first half of the preceding year. Class I railroads in the first half of 1931 used for locomotive fuel 42,672,474 tons of coal and 1,012,932,384 gallons of fuel oil.

W. B. T. & S. May Have Entrance to Port Arthur

An option, good for 60 days, has been secured by R. C. Duff, president of the Waco, Beaumont, Trinity & Sabine, for the purchase of the interurban electric railway of the Eastern Texas Electric Company, which runs between Port Arthur, Tex. and Beaumont, 25 miles. If the transaction is consummated, the lines may be made a part of a proposed electric railway between Houston and Port Arthur by way of Goose Creek, approximately 85 miles. The Interstate Commerce Commission has granted the Waco Beaumont, Trinity & Sabine permission to construct extensions of the line from Weldon to Waco and from Livingston to Beaumont, but denied that part of the application which sought a permit to build the proposed line from Beaumont to Port Arthur. By acquiring the interurban line, an entrance to Port Arthur will be secured for the Waco, Beaumont, Trinity & Sabine.

Complaints As to Express Sub-Block Rates Dismissed

The Interstate Commerce Commission has dismissed complaints filed by the Merchants' Association of New York and the Omaha Chamber of Commerce Traffic Bureau which had alleged that the methods used by the express companies since 1925 in computing rates to the "sub-blocks" provided for by the commission's scheme of express rate-making were in contravention of the commission's orders. While the commission's formula provided generally for computing rates by counting the sub-blocks in a straight line or at right angles, called the "air-line count"

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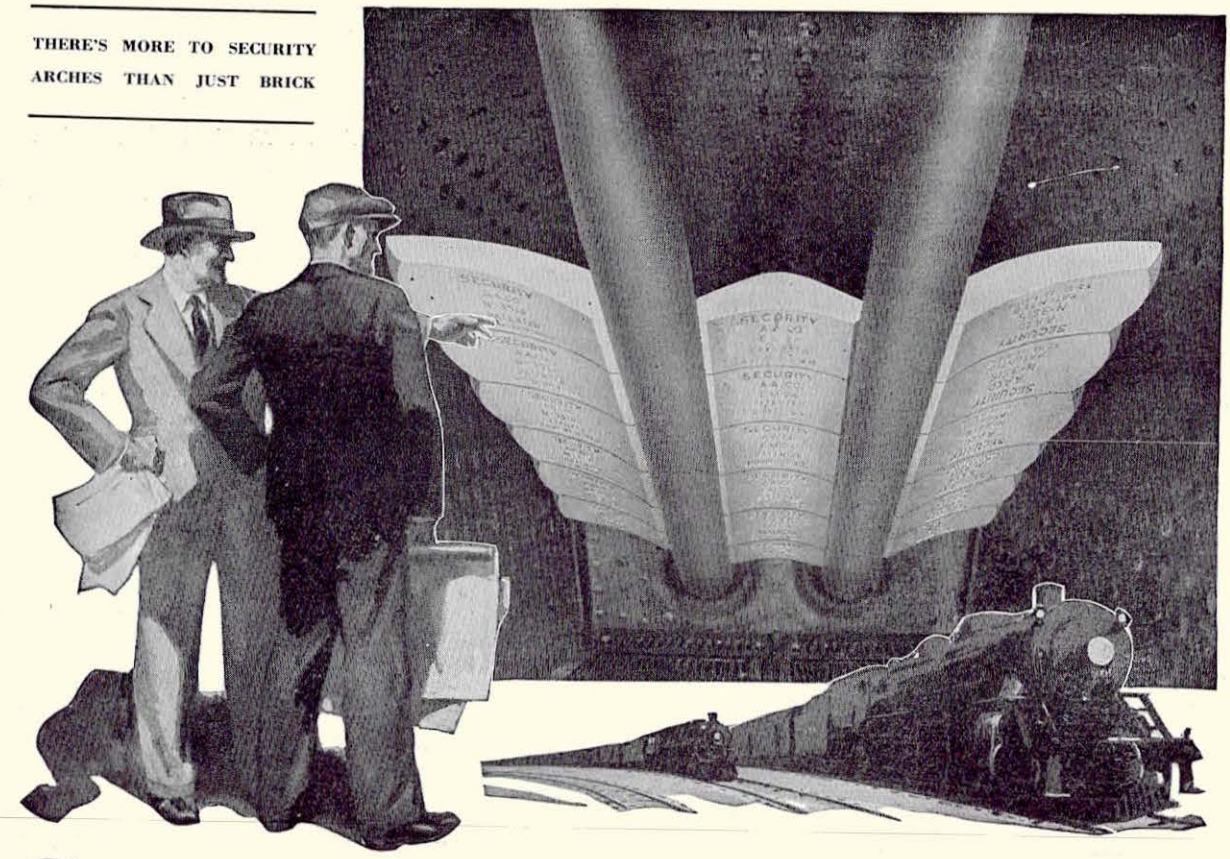
THERE'S MORE TO SECURITY ARCHES THAN JUST BRICK



Changes *in* Locomotive Operation

Work a HARDSHIP *on* ARCHES

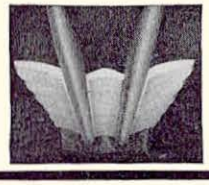
THE speeding up of operation by the use of higher power locomotives making longer continuous runs has resulted in splendid economies but it has been tough on the locomotive Arch.

Where the locomotive formerly loafed leisurely, it is now forced to its utmost.

Today the Arch makes its mileage in much shorter time than it did a few years ago, and under far more severe conditions.

Everything considered, Arch Brick render better service today than they ever did—a tribute to the constant efforts of the American Arch Company in developing the locomotive Arch.

HARBISON-WALKER REFRACTORIES CO.
Refractory Specialists



AMERICAN ARCH CO.
INCORPORATED
Locomotive Combustion Specialists » » »

method, its decision holds that the order allowed the express companies discretion, subject to its supervision, to make such exceptions to this basis as were reasonably necessary or appropriate, and it suggested in an appendix a basis for informal adjustment of complaints as to individual situations. The complaint was caused by the fact that the express companies used a count which exceeded the air-line count in instances where the short rail route traverses additional sub-blocks.

Vegetable Rates From Florida Revised on Class Basis

A revision of rates on potatoes, cabbage and vegetables, not otherwise specified, in carloads, from producing points in Florida to destinations throughout the United States, on the basis of rates in cents per 100 pounds instead of per package, has been prescribed by the Interstate Commerce Commission in a supplemental report on a complaint filed by the Railroad Commissioners of the State of Florida. Commissioner Mahaffie, who objected to the rates prescribed as being too low, said the effect would be a substantial reduction in carrier revenues, but the majority report said it was impossible to compare the new rates with the old ones, because of the change in the basis and the fact that the new rates, effective on October 26, are prescribed as percentages of the first-class rates prescribed in the southern class rate investigation. The rates as a whole have not been shown with any degree of conclusiveness to be intrinsically too high, the commission said, and the rates were declared unreasonable only for the future, but it was found that the present rate structure contains many inconsistencies and inequalities. Commissioner Farrell dissented and Commissioner Eastman dissented in part.

Grade Crossing Fatalities Increase

Although there were reductions for the month of May and for the first five months of this year, compared with the same periods last year, in the number of accidents at highway grade crossings and the number of persons injured, reports filed by the railroads with the Interstate Commerce Commission show increases in the number of fatalities in both periods. Fatalities at highway grade crossings, the Safety Section of the American Railway Association has announced, totaled 828 in the first five months of this year, an increase of 20 compared with the same period in 1930, while the number of persons injured totaled 2,100, or a reduction of 226 compared with the same period the preceding year. The number of accidents at high way grade crossings in the first five months of 1931 totaled 1,839 compared with 2,009 for the same period last year, or a reduction of 170. For May alone, there were 359 accidents at highway grade crossings, a reduction of seven under May, 1930, while 183 fatalities were reported as caused by those accidents, an increase of 18 compared with the number for May, 1930. Persons injured in highway grade crossing accidents in May, 1931, totaled 409 compared with 418 in the same month the preceding year.

Additional Through Routes Via Barge Line Required

The Interstate Commerce Commission has issued a supplemental report requiring connecting rail carriers to join the Mississippi Valley Barge Line in the establishment of many additional through routes and joint rates on classes and various commodities which the barge company asked following the commission's original order requiring such routes and rates via Cincinnati and New Orleans. In the original report the rates prescribed were in general based on a differential of 35 cents on first class under the corresponding rail rates but in the petitions for additional routes the company asked for rates determined by the so-called Ex Parte 96 formula commonly employed in making differential rates to which the federal barge line is a party. The commission's order provides for differentials of 10 and 20 per cent under the rail rates depending on the relation of the distance of the barge-rail route to the shortest all-rail distance. Commissioner Mahaffie, concurring in part, objected to the use of the lowest all-rail rates in fixing the differentials, instead of the lowest all-rail rates which apply via the gateways through which the traffic moves. The southwestern railroads had requested that no additional barge-rail rates be prescribed except after a hearing as to the respective costs of the rail and barge transportation, but the commission said that the way is open to them to invoke the procedure providing for a hearing after the establishment of the prescribed rates.

More Reduced Sleeping Car Rates

The Pullman Company has extended its experiment with reduced sleeping car charges to include a round trip rate from eastern cities to the Pacific Coast at a reduction of about 25 per cent; tickets to be sold on August 29 and September 5, 12, 19 and 26 (Saturdays). The charge for a lower berth, for instance, including railroad surcharge, from Boston, New York, Philadelphia, Baltimore, Washington, Richmond, and other eastern cities to destinations on the Pacific Coast—Seattle, Tacoma, Portland, San Francisco, Los Angeles or San Diego—and return to the starting point will be $50. The regular rate for a lower berth from Boston is $66.75.

The reduced rates are practically unrestricted as to route, but the return journey must be completed by October 20. There is to be no stopover enroute, but the passenger has the privilege of extending his stay on the Pacific Coast until the middle of October, the return trip originating at any of the selected destinations. This will allow the passenger who wants to cover all the points of interest on the coast in a thorough manner, to select the returning point of departure.

The adoption of this reduced Atlantic to Pacific excursion rate is experimental with the idea of determining whether a reduction in sleeping car charges together with the railroad companies' reduced summer fares, will attract additional railroad and Pullman travel. On August 20, the Pullman Company reduced the upper berth rate 37½ per cent between New York and Washington, D. C., in the east and between Chicago and the Twin Cities in the west, for the period ending November 20.

Railway Labor to Ask Shorter Work Periods

Legislation to provide for a shorter work-day and work-week for railway employees, "to reduce unemployment and stabilize employment," is to be sought by the Railway Labor Executives at the next session of Congress, according to a statement they have just issued in further explanation of the matters discussed at a three-day meeting in Washington last month. An executive committee was directed, with the aid of counsel, to prepare a bill to be introduced for that purpose. The plan has been under consideration at meetings of the railway labor organizations for a long time and the labor executives some time ago tried to bring about a conference with the Association or Railway Executives on the subject by including it in a plan for cooperating with the railway executives on methods for dealing with the competition of other forms of transportation. The executive committee includes D. B. Robertson, of the Brotherhood of Locomotive Firemen and Enginemen, A. Johnston, of the Brotherhood of Locomotive Engineers, A. O. Wharton, of the International Association of Machinists, F. H. Fljosdal, of the Brotherhood of Maintenance of Way Employees, and C. M. Sheplar, of the National Marine Engineers' Beneficial Association.

According to the statement the labor executives also discussed at some length, but deferred action on, the subject of unemployment insurance. They also approved certain principles to govern the draft of a bill to provide for "retirement insurance" by which railroads would be required to provide retirement insurance for superannuated employees, to be paid for through voluntary contributions from employer and employee fixed on a sound actuarial basis, "whereby the individual employee will acquire a vested right in trust funds, which can be maintained and enforced by him or his beneficiary just as other forms of insurance." After stating certain requirements the statement said that there has been no plan proposed and no bill dratfed which meets these requirements and that no bill will be endorsed by the association until they have been met.

I.C.C. Recaptures $8,241

First fruits of the vigorous program for the recapture of excess net railway operating income inaugurated by the Interstate Commerce Commission nearly two years ago were announced by the commission on August 25 in the form of a report stating that the Wyandotte Terminal had paid to it without protest the sum of $7,039.46, the unpaid balance of the $8,241 which had been found due, in a

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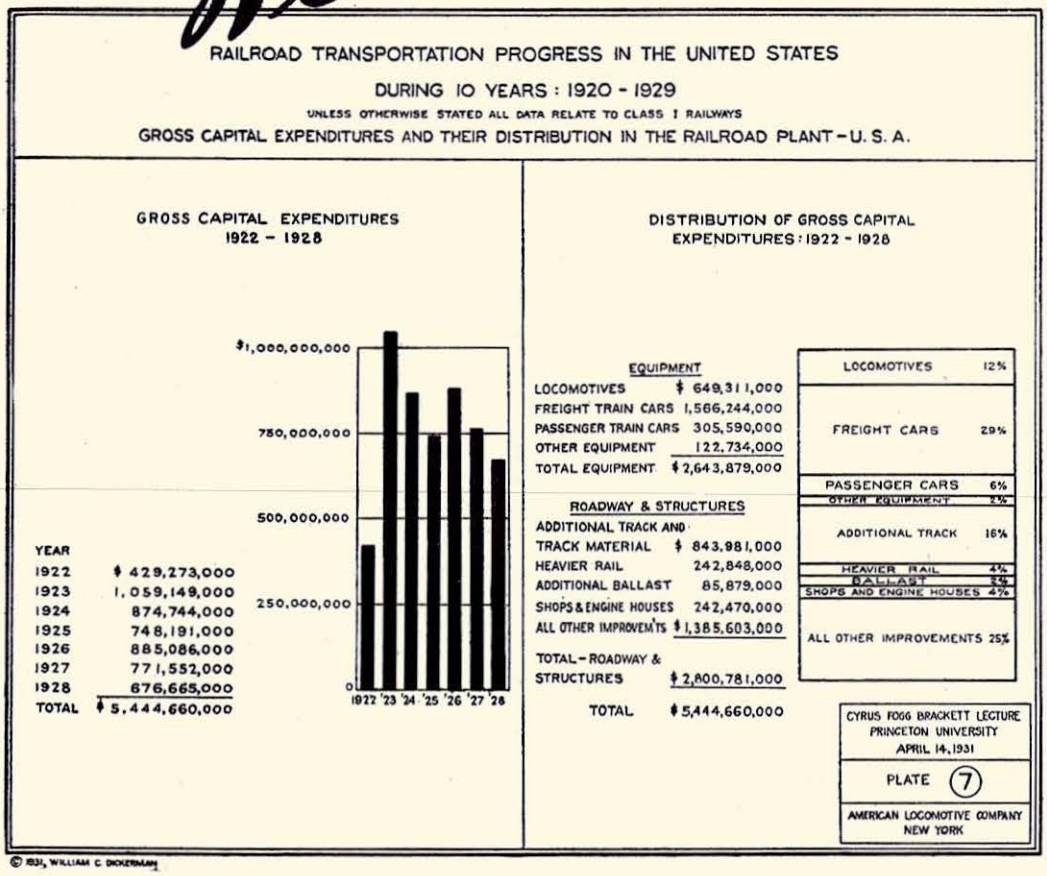
Where Are We Headed?



WHEN we consider what the locomotive designer has done in improving the locomotive as a whole in order to meet the conditions which are facing the railroads today, we cannot help but wonder why only 12 per cent of the expenditures shown in the above chart was for locomotives.

Of course, these figures ended with the year 1928—so let us bring them more up to date.

In 1929, $853,721,000 was spent in improving and enlarging railway properties. And, lo-and-behold, we find that the total expenditures for locomotives over the whole period, 1922 to 1929, has been reduced to 11 per cent!

Furthermore, we can positively predict that when the figures for 1930 and 1931 are added, this percentage is going lower yet.

The locomotive is the heart of the railroads' being. Therefore, if the future of our railroads depends upon their ability to provide the most economical and convenient transportation available, one might well ask "Where are we headed?"

American Locomotive Company
30 Church Street New York N.Y.

tentative recapture report and order of March 3, as representing half the excess for the years 1923, 1924 and 1926. The order provided that if no protest was filed by April 25 the tentative report would become final and an order has been entered making it final because the company has remitted the full amount. The Wyandotte Terminal operates about 6 miles of tracks serving the plants of the Michigan Alkali Company at Wyandotte and Ford City, Mich.

This represents the second final recapture order issued by the commission since its first such order, in the O'Fallon case, was set aside by the Supreme Court. The other final order was issued on April 7 in the case of the Richmond, Fredericksburg & Potomac, calling for $696,705, which the commission is seeking to collect by having the comptroller general withhold payments to the railroad for mail and other transportation. The commission has also received, since the passage of the transportation act, something over $10,000,000 in payments made by railroads in response to its annual circulars without specific orders of the commission fixing the amounts, but the bulk of such payments has been made with reservations or under protest.

Therefore the Wyandotte Terminal represents the first case in which the money has been paid in response to a specific order of the commission after a determination of its value, under the program undertaken by the commission after the Supreme Court had clarified the situation somewhat in the O'Fallon case, at least to the extent of informing the commission it could not hope to proceed with valuations on the basis it had been using. A court test of the plan adopted by the commission for giving some weight to current reproduction costs, or of the other disputed points involved in the valuation procedure, has so far been avoided by the failure of the R. F. & P. to attempt to contest the commission's order and by the commission's effort to have the comptroller general collect the money without suing for it.

> "Every day and every month, the people of the United States are spending vast sums of money in the construction of highways. They are paying large sums for the maintenance of those already built, and they do not have the common sense to assess those who use the highways a sufficient amount to reimburse the taxpayers. No matter what his occupation may be, or what business interest he may have, every man with sound judgment must recognize that these enormous expenditures for waterways, harbors and highways are raising the taxes of the individual to an unbearable extent, and he must recognize this because the facts are staring him in the face, every time he sees a tax bill."
>
> *T. C. Powell in the Illinois Journal of Commerce.*

Division VI, A. R. A., Appoints Committees

The Purchases and Stores division of the American Railway Association has announced the formation of committees for the year's work. Reports will be received from 26 committees, which will undertake the study of two new subjects: Handling of Materials Protection from Deterioration, and Lubrication.

The committees, and committee personnel, are as follows:

Purchasing and Stores Department Manual - Recommended Rules and Practices: H. R. Toohey (chairman), inspector of stores, C. M. St. P. & P.; W. E. Brady, stores accountant, A. T. & S. F.; P. L. Grammer, assistant purchasing agent, Penna.; J. J. Kukis, superintendent of stores, Erie; G. E. Scott (chairman ex-off.), purchasing agent, M-K-T.

Classification of Material: G. A. Goerner (chairman), traveling storekeeper, C. B. & Q.; C. M. Adams, Penna.; O. T. Burleigh, supervisor of materials, B. R. & P.; F. G. Drieling, division storekeeper, N. P.; G. H. Greer, assistant purchasing agent, M. & O.; J. P. Kimmel, district storekeeper, C. St. P. M. & O.; F. J. McMahon, general storekeeper, N. Y. C.; D. H. Reed, traveling storekeeper, Sou.; J. E. Mahaney (chairman ex-off.), general supervisor of stores, C. & O.

Recovery, Repairs and Reclamation of Discarded Material Classification, Handling and Sale of Scrap: I. C. Bon (chairman), superintendent of scrap and reclamation, Wab.; W. A. Clem, assistant purchasing agent, Reading; J. J. Collins, general foreman, scrap and reclamation plant, Erie; W. B. Gordon, assistant general storekeeper, C. N.; T. J. Hegeman, supervisor of reclamation, C. B. & Q.; J. C. Kirk, assistant general storekeeper, C. R. I. & P.; G. W. Lieber, superintendent of reclamation, M-K-T.; A. L. Prentice, supervisor of scrap and reclamation, N. Y. C.; H. M. Rainie, assistant to purchasing agent, B. & M.; B. W. Roberts, general purchasing agent, C. P.; W. P. Stewart, supervisor of scrap, I. C.; James Young, assistant purchasing agent, Penna.; C. B. Tobey (chairman ex-off.), general storekeeper, L. V.

Comparisons of Material Stock Reports and Stores Expenses: O. A. Donagan (chairman), general storekeeper, B. & M.; C. A. G. Blomquist, stores accountant, C. of Ga.; O. L. Browne, assistant to purchasing agent, A. C. L.; F. I. Foley, general storekeeper, N. Y. N. H. & H.; W. W. Griswold, purchasing agent, W. & L. E.; E. Harty, assistant general storekeeper, S. P.; L. Kilmer, stores accountant, C. N.; E. H. Landers, general storekeeper, C. C. C. & St. L.; J. K. McCann, general piecework inspector, C. B. & Q.; C. H. Murrin, general storekeeper, L. & N.; J. F. Riddle, statistician, Penna.; C. L. Wakeman, general storekeeper, Wab.; E. W. Walther, general storekeeper, B. & O.; C. Williams, district storekeeper, M. P.; A. L. Sorensen (chairman ex-off.), manager of stores, Erie.

Forest Products: J. E. McNelley (chairman), chief tie and lumber inspector, A. C. L.; E. J. Clark, chief lumber inspector, C. B. & Q.; T. H. Clarke, tie and timber agent, Sou.; James Deery, assistant purchasing agent, Penna.; D. R. Elmore, assistant to general manager, Fruit Growers' Exp.; H. W. Herbert, lumber buyer, I. C.; F. W. Holt, assistant purchasing agent, Erie; R. W. Keenan, tie and timber agent, C. C. C. & St. L.; J. H. Lauderdale, general purchasing agent, I.-G. N.; J. R. McGrenera, general lumber and tie inspector, A. T. & S. F.; C. F. Philbrook, tie and timber agent, B. & M.; F. V. Weisenburger, timber agent, N. P.; L. P. Krampf (chairman ex-off.), supply agent, M. P.

Purchasing and Storekeeping for Highway Motor Vehicles: J. L. Sullivan (chairman), general traveling storekeeper, U. P.; G. W. Alexander, general storekeeper, C. of Ga.; R. C. Harris, general storekeeper, Penna.; J. T. Kelly, general storekeeper, C. M. St. P. & P.; Frank McGrath, traveling storekeeper, B. & M.; E. S. Montgomery, assistant purchasing agent, N. Y. N. H. & H.; J. S. Sewall, district storekeeper, N. P.; C. E. Walsh (chairman ex-off.), purchasing agent, Penna.

Workable Rules in Connection with the Carrying Out of the Provisions of Section 10 of the Clayton Anti-Trust Act: H. C. Pearce (chairman), director of purchases and stores, C. & O.; W. C. Bower, vice-president, N. Y. C.; E. A. Clifford, general purchasing agent, C. & N. W.; W. W. Morris, assistant general purchasing agent, Penna.

Control of Shop Manufacturing Orders for Stock Material: E. B. DeVilliss (chairman), assistant stores manager, Penna.; E. J. Becker, district storekeeper, S. P.; J. E. Bogan, division storekeeper, M. P.; G. J. Hunter, traveling material supervisor, A. T. & S. F.; J. B. Livingston, district storekeeper, C. N.; J. Maier, storekeeper, C. B. & Q.; J. J. McKinnon, storekeeper, B. & M.; C. G. Sutton, division storekeeper, B. & O.; J. E. Mahaney (chairman ex-off.), general supervisor of stores, C. & O.

Fuel: C. E. Smith (chairman), vice president, N. Y. N. H. & H.; J. J. Bennett, purchasing agent, I. C.; P. Hunter, assistant purchasing agent, C. B. & Q.; J. M. Johnston, fuel agent, M-K-T.; E. J. Lamnick, fuel purchasing agent, Penna.; M. E. Towner, general purchasing agent, W. Md.

Most Economical Methods of Purchasing and Distributing Materials: A. W. Munster (chairman), purchasing agent, B. & M.; W. H. Morris, general storekeeper, Reading; F. A. Murphy, district storekeeper, B. & O.; E. H. Polk, district storekeeper, S. P.; A. S. Thompson, purchasing agent, C. & G.; J. W. Wade, general storekeeper, N. & W.; H. Wilson, assistant to general purchasing agent, U. P.; C. L. Wright, general storekeeper, M-K-T.; J. L. Bennett (chairman ex-off.), purchasing agent, C. of Ga.

Pricing Methods: U. H. Hall (chairman), general supervisor of stores, U. P.; L. J. Ahlering, general storekeeper, C. & E. I.; J. W. Hagerty, purchasing department, Penna.; J. P. Hogan, chief accountant, stores department, Erie; J. F. McAlpine, chief clerk to general storekeeper, C. B. & Q.; K. H. Ryall, storekeeper, C. N.; E. A. Clifford (chairman ex-off.), general purchasing agent, C. & N. W.

Purchasing Agent's Organization and Office Records: Arthur Aiken (chairman), office manager, purchasing department, Penna.; C. D. Baldwin, purchasing agent, Bang. & Aroos.; C. Miles Burpee, purchasing engineer, D. & H.; E. A. Bromley, assistant purchasing agent, C. N.; T. M. McKeown, assistant purchasing agent, C. P.; E. T. Monroe, general purchasing agent, B. R. & P.; C. R. Painter, purchasing agent, N. Y. N. H. & H.; A. A. Taylor, assistant to general purchasing agent, M. P.; M. L. Tynan, general purchasing agent, Ry. Exp. Agcy.; H. E. Warren, manager purchases and stores, G. M. & N.; F. S. Austin (chairman ex-off.), purchasing agent, B. & A.

Stationery and Printing: J. T. Van Horn (chairman), stationer, M. P.; H. P. Buchenery, stationery storekeeper, S. P.; Vincent Erb, stationer, Reading; O. F. Kaapke, stationery storekeeper, C. & N. W.; T. J. Kane, stationery storekeeper, C. N.; R. H. King, stationer, M-K-T.; F. J. Mayer, assistant to purchasing agent, I. C.; H. P. McQuilkin (chairman ex-off.), assistant purchasing agent, B. & A.

Fire Prevention: J. H. Ellis (chairman), storekeeper, C. B. & Q.; S. E. Keillor, district storekeeper, C. N.; J. W. Watkins, district storekeeper, L. V.; H. Weindel, district storekeeper, U. P.; L. B. Wood (chairman ex-off.), general storekeeper, S. P.

Handling of Materials -Protection from Deterioration: O. Nelson (chairman), general storekeeper, U. P.; S. L. Bonque, general inspector of stores, S. P.; F. V. Burton, stores inspector, C. N.; D. W. Corcoran, general storekeeper, C & N. W.; R. D. Crawford, general storekeeper, I.-G. N.; V. N. Dawson, assistant general storekeeper, B. & O.; J. S. Genther, general storekeeper, L. & N. E.; R. R. Jackson, division storekeeper, Wab.; G. W. Leary, supervisor of shop transportation, C. & O.; A. L. Lemay, division storekeeper, C. M. St. P. & P.; L. P. Krampf (chairman ex-off.), supply agent, M. P.

Standardization and Simplification of Stores Stocks: E. D. Toye (chairman), general storekeeper, C. N.; R. G. Bensen, classification inspector, Erie; H. W. Concannon, district storekeeper, S. P.; L. F. Duvall, assistant general storekeeper, A. C. L.; A. G. Follette, assistant chief material supervisor, Penna.; W. L. Hunker, district storekeeper, C. R. I. & P.; G. W. Leigh, purchasing agent, M. St. P. & S. S. M.; G. H. McGill, traveling storekeeper, N. Y., N. H. & H.; F. W. Reynolds, district storekeeper, B. & O.; W. W. Williams, chief requisition bureau, N. Y. C.; F. S. Austin (chairman ex-off.), purchasing agent, B. & A.

Stores Department Safety Practices: D. Robertson (chairman), assistant general storekeeper, C. N.; A. P. Dunbar, storekeeper, B. & M.; W. N. Endy, assistant to general storekeeper, Reading; D. B. Rivers, district storekeeper, C. M. St. P. & P.; H. O. Wolfe, general storekeeper, Alton; J. U. King (chairman ex-off.), general storekeeper, A. C. L.

Terminal Railway Storekeeping: C. W. Yeamans (chairman), purchasing agent, C. & W. I.; A. W. Blume, general storekeeper, St. L.-S. F.; J. C. Dods, general storekeeper, K. C. T.; A. F. Kreglow, storekeeper, Wash. Term.; J. T. O'Dea, assistant to president and purchasing agent, P. & P. U.; J. F. Rex, division storekeeper, U. P.; R. A. Schuff, storekeeper, C. B. & Q.; G. E. Scott (chairman ex-off.), purchasing agent, M-K-T.

Capacity Loading and Prompt Handling of Company Material Cars, Cost to Railroad of Hauling Company Material: J. G. Stuart (chairman), general storekeeper, C. B. & Q.; B. T. Adams, assistant general storekeeper, I. C.; J. L. Harbry, assistant general storekeeper, P. M.; T. A. Hodges, general storekeeper, S. A. L.; E. H. Hughes, general storekeeper, K. C. S.; J. L. Irish, general storekeeper, U. P.; J. C. Jackson, general storekeeper, C. N.; J. B. Noyes,

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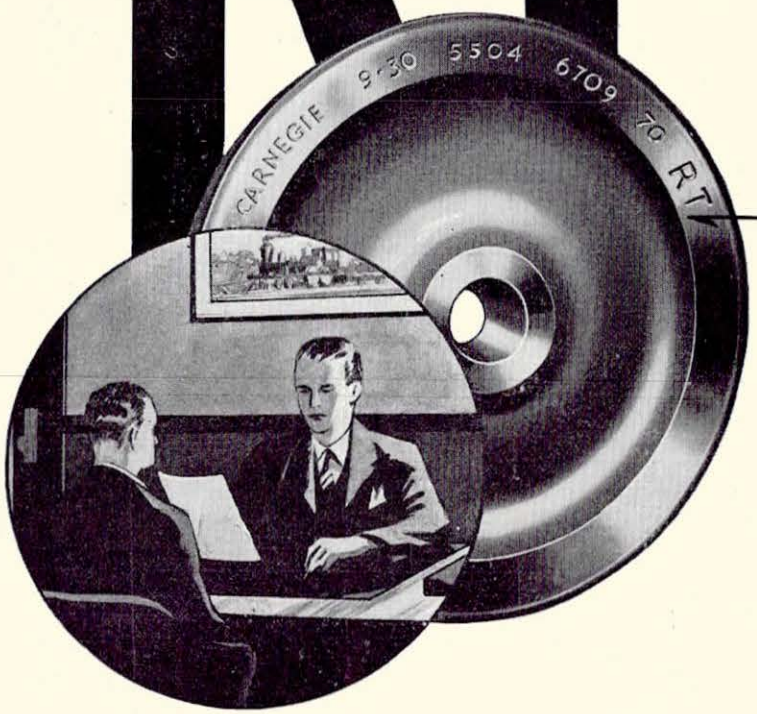

* The mark identifying wheels particularly adapted for modern heavy-duty service.

Two *important* letters in the Railroad Man's alphabet R T

The eighteenth and twentieth letters of the alphabet have taken on a new significance for the railroad man. Stamped on Carnegie Wrought Steel Wheels, the initials "R T" mean Rim-Toughened. They indicate the additional refinement of heat treatment, the process of which produces a wheel with an especially tough rim and with high physical properties . . . a wheel with the extra stamina to endure the stress and strain of modern heavy-duty service. Accurate machining insures perfect rotundity with a consequent increase in riding comfort.

Carnegie special rim-toughened wheels are furnished for passenger, engine truck and tender service. Carnegie Single-Life wheels, rim-toughened, are also available for 70-ton freight service. You already know the outstanding advantages of wrought steel. Learn now of this further improvement. Put your O K on R T wheel specifications and learn how friendly these initials are to your maintenance appropriation. Our wheel engineers will gladly bring you complete details.

CARNEGIE WROUGHT STEEL WHEELS

Product of Carnegie Steel Company, Pittsburgh, Pa. U S STEEL *Subsidiary of United States Steel Corporation*

150

general storekeeper, M. St. P. & S. S. M.; H. C. Ralls, district storekeeper, M. P.; H. E. Ray, general storekeeper, A. T. & S. F.; G. P. Turner, district storekeeper, Sou.; W. Davidson (chairman ex-off.), general storekeeper, I. C.

Joint Committee on Metric System: J. W. Gerber (chairman), general storekeeper, Sou.; J. F. Marshall, purchasing agent, Chicago & Alton; E. J. Myers, general storekeeper, N. P.

Purchasing, Storage and Distribution of Equipment and Supplies Used in Dining Cars, Hotels and Commissaries: L. V. Hyatt (chairman), commissary purchasing agent, M. P.; A. J. Amory, assistant purchasing agent, C. N.; W. J. Burns, assistant purchasing agent, C. P.; H. A. Hansen, superintendent of dining cars, U. P.; L. M. Jones, superintendent of dining cars, C. M. St. P. & P.; H. N. Mellor, commissary buyer, Penna.; T. K. Russell, assistant dining car superintendent, I. C.; D. A. Williams, assistant to purchasing agent, B. & O.; A. L. Sorensen (chairman ex-off.), manager of stores, Erie.

Training of Employees in Purchasing and Stores Departments: C. A. Nichols (chairman), traveling storekeeper, N. P.; H. B. Akin, district storekeeper, C. N.; J. C. Baker, traveling storekeeper, Sou.; R. J. Gable, division storekeeper, I. C.; J. A. King, division storekeeper, C. & N. W.; S. A. Montgomery, assistant to purchasing agent, Penna.; C. L. Nash, general storekeeper, Fruit Growers' Exp.; F. C. Warren, general storekeeper, St. L. Sw.; E. F. Hasbrook (chairman ex-off.), purchasing agent, C. B. & Q.

Lubrication: T. H. Ryan (chairman), assistant purchasing agent, Wab.; C. C. Hubbell, purchasing agent, D., L. & W.; S. A. Hayden, chief clerk to general storekeeper, M-K-T.; C. L. McIlvaine, assistant purchasing agent, Penna.; W. S. Morehead, assistant general storekeeper, I. C.; F. J. O'Connor, assistant purchasing agent, C. M. St. P. & P.; E. W. Peterson, general storekeeper, Bang. & Aroos.; E. A. Clifford (chairman ex-off.), general purchasing agent, C. & N. W.

Systematic Inspection of, Checking of Weights and Count of Materials Received at Destination: C. K. Reasor (chairman), assistant manager of stores, Erie; J. H. Brown, general storekeeper, C. N.; J. C. Glenn, division storekeeper, C. of N. J.; J. T. Goodloe, division storekeeper, Sou.; J. V. Miller, assistant general storekeeper, C. M. St. P. & P.; F. H. Remaley, division storekeeper, B. & O.; C. H. Shuart, traveling storekeeper, A. T. & S. F.; W. Davidson (chairman ex-off.), general storekeeper, I. C.

Organization and Methods for Adoption of Material Standards: A. S. McKelligon (chairman), general storekeeper, S. P.; D. C. Curtis, chief purchasing officers, C. M. St. P. & P.; C. C. Kyle, purchasing agent, N. P.; A. N. Laret, assistant to vice-president, St. L.-S. F.; H. C. Pearce, director purchases and stores, C. & O.; L. P. Krampf (chairman ex-off.), supply agent, M. P.

Joint Purchases and Stores and Mechanical Committee on Reclamation: I. C. Bon (chairman), superintendent of reclamation, Wab.; G. W. Lieber, superintendent of reclamation, M-K-T.; A. L. Prentice, supervisor of scrap and reclamation, N. Y. C.; W. P. Stewart, supervisor of scrap, I. C.; J. W. Bukey, foreman of reclamation plant, Penna.; L. R. Wink, assistant superintendent car department, C. & N. W.

Foreign

New Diesel Locomotives in Great Britain

Three new Diesel-electric locomotives recently completed in England are being tested on British railways during the present month, according to reports received by the United States Department of Commerce. Power for the motors is supplied by generating units driven by Diesel engines and it is estimated that under normal conditions they will run for nine hours on one ton of heavy oil.

Fares Varying with Speed Proposed for Britain

Revision of passenger rate structures of British railways with a view to the development of "some system that would automatically spread the traffic more equally over the available service" is advocated by H. Cawthra in an article appearing in a recent issue of the Railway Gazette (London). Specifically he suggests that the fast long-distance trains be restricted, through the imposition of higher fares, to long-distance passengers while rates on the slower trains are reduced.

Mr. Cawthra's article is a comment on the findings of the Royal Commission on Transport which in its recent report discussed (1) Inadequacy of seating accommodation in the trains; (2) need for cheaper traveling without the restrictions at the present time imposed on reduced-fare travel. The writer concedes that occasionally some of the better express trains are overcrowded but holds that at the same time slower trains, serving the same places, are often run with few passengers. He next reviews the train classification systems (on basis of speed) of continental Europe and suggests the adaptation of some features of these systems to Great Britain. Such a classification of trains, with rates of fare varying according to class, he continues, would enable the railways to reduce the standard scale of fares by other than principal express trains; it would have the effect of distributing the traffic more evenly and would aid in the recovery of short-haul traffic.

Mr. Cawthra suggests finally that the abolition of the present liberal free baggage allowance and the substitution of "a system of charges for registration and conveyance of luggage would have the effect of making the charge to the individual passenger more commensurate with the service rendered to him, and also provide revenue to assist in the scheme of reducing the standard scale of rates for the conveyance of passengers."

Pneumatic-Tired Rail Car Developed in France

A pneumatic-tired rail motor car, recently developed in France, performed satisfactorily in a series of tests conducted on the Paris-Orleans and the French State railways, under the auspices of the Michelin Tire Company. The car, according to the description in a recent issue of Modern Transport (London), embodies an adaptation of the automobile design with streamline effects; it is equipped with a 46 h.p. engine and weighs approximately four tons.

The wheel on which the newly-developed pneumatic tire is fitted consists of a central hub with a detachable flanged steel rim, similar to the steel tires on railway rolling stock. The tire rests on the flat rim against the inner flange, and is held in position by a smaller flange attached to the face of the wheel. The tire is so designed that a puncture is followed by a barely perceptible deflation and thus the danger of derailment from a blowout is minimized. Among the advantages claimed for the vehicle are its smoother riding qualities, and its ability to be stopped in a short distance because of the adhesion qualities of rubber and steel. The vehicle is not at present designed for interchangeability between rails and highway.

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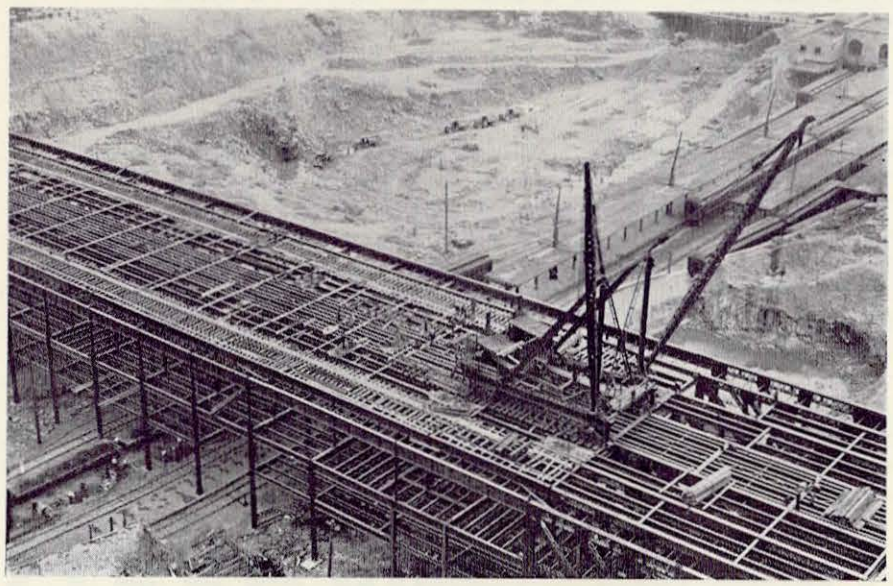

Photograph Taken August 6, Showing the Status of the Canadian National's Passenger Terminal Project at Montreal, Que., in the Area of the Passenger Station Proper

Excavation and the new Dorchester Avenue bridge shown spanning the site are practically completed. A portion of the Mt. Royal station train sheds may be seen at the right

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THE PASSENGER TRAINS of the Long Island Railroad, in the seven months ending with August, made a record of 99.8 per cent perfect; the number of scheduled passenger trains run in that time being 189,822 and the number reported late being only 295. In addition, there were 22,398 other fast trains operated.

SUMMER ROUND TRIP PASSENGER TICKETS, which are 25 per cent cheaper than the regular fare, will, for the remainder of the season, be good on all of the Pennsylvania's "blue ribbon" trains to the West except the Broadway Limited, according to an announcement by F. W. Conner, passenger traffic manager in Philadelphia, Pa. These tickets will be on sale each Saturday until September 26, inclusive, and will be good for 30 days in addition to the date of sale.

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Make full use of . . . . ALLOY STEELS

ACATHON STEELS

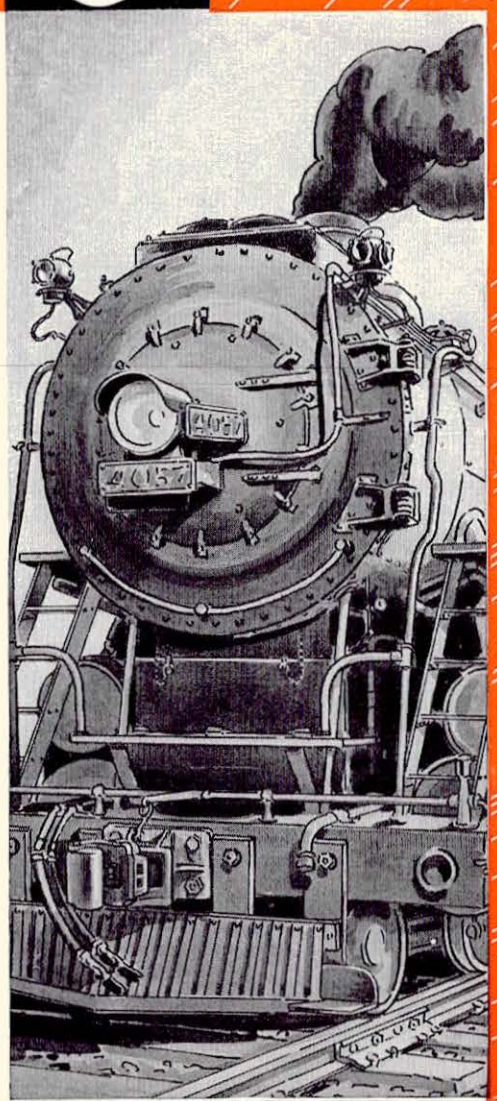
LOCOMOTIVES are employing modern alloy steels and irons in ever-increasing quantity.

Rods, axles and pins have long been accepted applications for alloy steels. But progressive roads have not stopped there. Alloy irons and steels are enabling them to combat corrosion in staybolts, tubes and firebox sheets; to lighten weight by using stronger materials; to employ higher pressures safely.

Even now the possibilities have scarcely been scratched.

The future holds forth the increasing use of heat-resisting alloys for tubes and sheets; of alloy steel boiler shells; of wearing surfaces with a hardness and toughness that will give far longer life and reduced maintenance.

Keep informed on alloy steel and iron developments. Consult Republic metallurgists on new applications.



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IRON

CENTRAL ALLOY DIVISION
REPUBLIC STEEL
CORPORATION
Massillon, Ohio

Equipment and Supplies

IRON & STEEL

The Cincinnati Union Terminal is inquiring for 4,600 tons of rail, and a quantity of tieplates, spikes, splice bars and bolts.

SIGNALING

The Western Pacific has ordered from the Union Switch & Signal Company material for an electric interlocking at Keddie, Cal., a junction. Searchlight signals will be used.

The Lehigh Valley has ordered from the General Railway Signal Company material for a centralized traffic control machine to be installed at Potter, N. J., to operate five signals and two switch machines.

The New York Rapid Transit Commission has ordered from the General Railway Signal Company materials for 16 signals and 30 automatic train stops to be installed on the Canarsie line (Borough of Brooklyn, New York City).

Supply Trade

The Ingot Iron Railway Products Company, Middletown, Ohio, has opened a branch office at 509 Forsyth building, Atlanta, Ga. **E. T. Cross** has been placed in charge.

John S. Bleecker, formerly consulting engineer specializing in transportation and merchandising, has been appointed manager of sales of **Lukenweld, Inc.,** division of Lukens Steel Company, Coatesville, Pa.

The Joyce Cridland Company, Dayton, Ohio, manufacturers of Joyce jacks and Joyce auto lifts, has moved its New York office from 105 West Fortieth street to 143 Liberty street. **Arthur S. Beattys,** eastern sales manager, is in charge.

The Reading Iron Company, Reading, Pa., has consolidated its general executive and general sales offices in Philadelphia, Pa., on the tenth floor of the Terminal Commerce building, 401 North Broad street. These offices will be occupied about August 31.

The Illinois Malleable Iron Company, Chicago, has taken over the manufacture and sale of the Ericson rail anchor, formerly manufactured by the Verona Tool Works, and has appointed the **Industrial & Railroad Supply Company,** 310 South Michigan avenue, Chicago, representatives in charge of sales.

William F. James, middle Atlantic district manager, Philadelphia, Pa., of the **Westinghouse Electric & Manufacturing Company,** has been appointed assistant to the commercial vice-president of the Atlantic division with the same headquarters. **E. W. Loomis,** manager of the Northeastern industrial division, has been appointed middle Atlantic district manager, with headquarters at Philadelphia, succeeding Mr. James, and **R. R. Davis,** who has been engaged during the past 21 years in various Westinghouse advertising activities, has been appointed apparatus advertising manager, with headquarters at East Pittsburgh, Pa.

OBITUARY

D. A. Lucas, vice-president of the Prime Manufacturing Company, Milwaukee, Wis., died suddenly on August 16, following a two weeks' illness. A photograph of Mr. Lucas and a sketch of his business career appeared in the *Railway Age* of June 20, page 1220, at the time of his election as vice-president of the Prime Manufacturing Company.

Bruce Ford, second vice-president of the Electric Storage Battery Company, died at his home at Chestnut Hill, Philadelphia, Pa. on August 10. Mr. Ford who was an authority on storage batteries, had more than 80 inventions to his credit. He was born at Brooklyn, N. Y., 58 years ago, and was educated at St. Paul's School, Garden City, N. Y., and Brooklyn Polytechnic Institute. After serving two years as a draftsman with the Electric Storage Battery Company, he left the company in 1892 and became associated with the Johnson

Bruce Ford

Company and the Lorain Steel Company at Johnstown, Pa. In 1899 he returned to the service of the Electric Storage Battery Company as engineer in charge of development and design. He rose rapidly, becoming vice-president in charge of technical development in 1913. Mr. Ford was a member of a number of technical associations at the time of his death.

Construction

Atchison, Topeka & Santa Fe.—This road contemplates the construction of a steel bridge about 500 ft. long over the North Canadian river at Oklahoma City, Okla.

Canadian National.—Contracts have been awarded to Paul Tremblay, Hebertville, Que., for the construction at that point of a brick and concrete station and freight house, 73 ft. by 30 ft., to replace a similar building destroyed by fire some time ago, and to the Canada Paving & Supply Corporation, Toronto, Ont., for the construction of a subway to carry St. Clair avenue, West, Toronto, under the Canadian National and the adjoining Canadian Pacific tracks.

Chesapeake & Ohio. This railroad has authorized the construction of an overhead crossing at Monmouth street, Newport, Ky., at an estimated cost of $710,700, and the extension of its westbound passing track at Alderson, W. Va., at a probable cost of $28,400, while a contract has been awarded to the Sturm & Dillard Company, Columbus, Ohio, for the enlarging and relining, at a cost of about $51,000, of Moores Tunnel, Backbone, Va.

Chicago, Rock Island & Pacific.—As a part of its project for the conversion of 231 locomotives from coal burning to oil burning, this road has undertaken the construction of fuel oil stations at 17 points on its lines south and west of Kansas City, Mo. These stations have a total estimated cost of about $90,000 and all work will be done by railway company forces. Each station will consist of a second hand tank car body buried in the ground near the fueling track, a track trough for unloading oil into the car body, one or more oil cranes and the necessary pumping facilities. At Armourdale, near Kansas City, a 5,000-bbl. tank for the storage of fuel oil will be constructed.

Delaware, Lackawanna & Western.—This company has awarded to the Rust Engineering Company, Pittsburgh, Pa., a contract for the construction of three bridges to carry the railroad's tracks over New Jersey State Highway No. 30, at Washington, N. J., and Hampton. One of these bridges will be on the main line at Washington, another on the Phillipsburg branch at Washington, and the third on a branch at Hampton. All three bridges call for a total of approximately 1,500 cu. yd. of excavation, 4,000 cu. yd. of concrete, 175 tons of reinforcing steel, 7,000 sq. ft. of waterproofing, 18,500 cu. yd. of street grading, and 200 lin. ft. of tile drain. The work is to be done under

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BETTER FIRES

FIREBAR CORPORATION
CLEVELAND OHIO.

the direction of the railroad, while the cost will be divided between the railroad and the state.

ILLINOIS TERMINAL.—A contract for the wrecking of the 10-story building at the northeast corner of Twelfth boulevard and Washington avenue, St. Louis, Mo., as the first step in the construction of this company's office building and passenger station on that site, has been awarded to Merker & Company, St. Louis. The first unit of the building, which will cost about $750,000, will be 11 stories in height, although it is planned ultimately to extend it to 20 stories. It is estimated that the wrecking of the old building and the clearing of the site will require about two months. Construction of the new building will be commenced immediately after the completion of this work.

NEW YORK CENTRAL.—This company and the Michigan Central have applied to the Interstate Commerce Commission for authority to construct a cross-over line at Grand Rapids, Mich., 7.25 miles.

PENNSYLVANIA.—In connection with its electrification program, this company has awarded to Gibbs & Hill, Inc., New York, a contract amounting to $350,000 for the construction of concrete foundations and guy anchors for catenary supporting and transmission structures on its main line, from Olden avenue, Trenton, N. J., to Millstone Jct., and on its Princeton branch, from Princeton, N. J., to Princeton Jct. Contracts have also been awarded to the John F. Casey Company, Pittsburgh, Pa., for the construction of two additional main tracks and of certain industrial and yard tracks between Gwynn's Run Cabin and Loudon Park Cabin, Baltimore, Md., at a total cost of approximately $298,000; to the Ambler Construction Company, Philadelphia, Pa., for furnishing and depositing dredging material as fill on Pennsylvania Railroad property in the vicinity of Girard Point yard, Philadelphia, at an estimated cost of $200,000, and to John H. Wickersham, Lancaster, Pa., for the construction, at a cost of about $34,000, of an overhead bridge at Lititz Pike, Lancaster.

SOUTHERN PACIFIC.—A contract has been awarded to the Merritt-Chapman & Scott Corp., San Pedro, Cal., for the construction of a highway subway under the tracks of this company about 10 miles west of El Rio, Cal., at a cost of approximately $72,000.

TERMINAL RAILROAD ASSOCIATION OF ST. LOUIS.—In connection with the project for the construction of a new Union station at East St. Louis, Ill., this road plans to replace the Broadway viaduct with a reinforced concrete and steel subway under its tracks, at a cost of about $200,000. The city council of East St. Louis has approved plans for a two-track viaduct which the Terminal Railroad plans to construct over Trendley avenue near Cahokia creek. This project, which is also a part of the general improvement plan at East St. Louis, is estimated to cost about $100,000.

Financial

ATCHISON, TOPEKA & SANTA FE.—*Trackage Rights.*—The Interstate Commerce Commission has authorized this company and its subsidiary, the Elkhart & Santa Fe, to operate under trackage rights over the Colorado & Southern between Clayton, N. M., and Mount Dora, 17.4 miles, in lieu of construction by the Elkhart of a line between these points heretofore authorized.

BOSTON & MAINE.—*Passes Common Dividend.*—The directors of this company at their meeting on August 25 failed to take action on the common dividend, upon which the last quarterly disbursement of $1 a share was made for the first quarter on April 1. Regular dividends were declared on the prior preference, first preferred and preferred stock.

CHARLES CITY WESTERN.—*Bonds.*—The Interstate Commerce Commission has authorized this company to issue $350,000 of first mortgage 6 per cent bonds, $119,200 to be used to retire first mortgage notes and the remainder to be pledged as collateral security for loans.

CHICAGO GREAT WESTERN.—*Valuation.*—The Interstate Commerce Commission has found the final value for rate-making purposes of the property owned and used for common-carrier purposes as of 1916 to be $47,062,000, while the final value of the property of the Mason City & Fort Dodge and of the Wisconsin, Minnesota & Pacific, leased to the C. G. W., has been placed at $13,825,000 and $5,725,000, respectively. The investment of the Chicago Great Western in road and equipment, including land, was stated in its books as $110,795,628. If readjustments were made, the report says, this would be reduced to $110,630,799, of which $105,189,728, less an undetermined portion assignable to offsetting items recorded at $5,231,759, represents the par value of securities or other obligations issued or assumed.

LONG ISLAND.—*Valuation.*—The final value for rate-making purposes as of 1916 of the property owned and used for common-carrier purposes was placed at $69,125,000 in a final valuation report made public by the Interstate Commerce Commission. The value of the property used but not owned was placed at $23,403,971. The investment in road and equipment, including land, was shown in the books as $73,320,133, but the report says that if certain readjustments were made, as detailed in the order, this would be reduced to $62,290,903.

MAINE CENTRAL.—*Acquisition and Operation.*—The Interstate Commerce Commission has authorized this company to acquire and operate by lease the Upper Coos Railroad (New Hampshire), extending from Quebec Junction, Vt., and from Brunswick, Vt., to Canaan, Vt., 41.5 miles; the Upper Coos Railroad (Vermont), extending from Canaan to Beechers Falls, 1.6 miles; and the Coos Valley Railroad, extending from Guildhall to Brunswick, 12.3 miles. The Maine Central owns the entire capital stock of the lessors.

NEW YORK, CHICAGO & ST. LOUIS.—*Bonds.*—This company has applied to the Interstate Commerce Commission for authority to nominally issue $10,500,000 of refunding mortgage 4½ per cent bonds, to be pledged as collateral for short-term notes. The company is negotiating with the Guaranty Trust Company of New York for $6,000,000 of 4½ per cent six-months notes, the proceeds to be used in paying $3,750,000 of notes due August 26 and to provide $2,250,000 for current cash necessities.

PENNSYLVANIA.—*Bonds.*—The Interstate Commerce Commission has authorized the Pennsylvania, Ohio & Detroit, to issue $3,242,000 of first and refunding mortgage bonds, series B, to be delivered at par to the Pennsylvania in partial reimbursement for capital expenditures and advances to meet retiring bonds. The Pennsylvania is authorized to assume obligation as guarantor of these bonds.

PITTSBURGH & WEST VIRGINIA.—*Abandonment.*—This company has applied to the Interstate Commerce Commission for authority to abandon certain terminal facilities at Pittsburgh, Pa., on the north side of the Monongahela river, together with the bridge across the river and a tunnel through Mt. Washington, under an agreement with Allegheny county, which desires to use some of the property in a road-building plan.

SEABOARD AIR LINE.—*Readjustment.*—The Interstate Commerce Commission has authorized the receivers of this company to use $1,135,714 of the proceeds derived from the sale of common stock for the acquisition of certain equipment trust obligations maturing during the current year.

TEXAS & PACIFIC.—*Acquisition.*—This company has applied to the Interstate Commerce Commission for authority to acquire control of the Fort Worth Belt by purchasing 60 per cent of its stock for $900,000.

Average Prices of Stocks and of Bonds

	Aug. 25	Last week	Last year
Average price of 20 representative railway stocks.	59.28	60.70	113.02
Average price of 20 representative railway bonds..	85.53	87.05	95.52

Dividends Declared

Boston & Albany.—2 per cent, quarterly, payable September 30 to holders of record August 31.

Boston & Maine.—7 Per Cent Prior Preference $1.75, quarterly; First Preferred A, $1.25, quarterly; First Preferred B, $2.00, quarterly; First Preferred C, $1.75, quarterly; First Preferred D, $2.50, quarterly; First Preferred E, $1.12½, quarterly; Old Preferred, $1.50, quarterly, all payable October 1 to holders of record September 12. Common quarterly dividend omitted.

Chesapeake & Ohio.—Common, 62½c, quarterly, payable October 1 to holders of record September 8; Preferred, $3.25, payable January 1, 1932, to holders of record December 8.

Consolidated Railroads of Cuba.—Preferred, 1½ per cent, quarterly, payable October 1 to holders of record September 10.

Southern Pacific.—1½ per cent, quarterly, payable October 1 to holders of record August 28.

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Super-Service Cylinder Packing

HUNT-SPILLER *Duplex Sectional Packing* has justly earned this name by its performance on all types of modern power.

Inspections after unusual mileage invariably show that *Duplex Sectional Packing* is in perfect condition for many more months of service.

Cylinder blows rarely develop—locomotives handle trains better and consume less coal—mileage between renewals is breaking all former records.

If you are looking for ways to reduce operating expenses apply *Duplex Sectional Packing.*

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Reg. U. S. Trade Mark

Cylinder Bushings
Cylinder Packing Rings
Pistons or Piston Bull Rings
Valve Bushings
Valve Packing Rings
Valve Bull Rings
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Hub Liners
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Export Agent for Latin America:
International Rwy. Supply Co., 30 Church Street, New York, N. Y.

HUNT-SPILLER GUN IRON

Air Furnace

Railway Officers

OPERATING

William E. McGraw, who resigned several months ago as general superintendent of the St. Louis Southwestern, has been appointed special representative of the vice-president (operating) of the St. Louis-San Francisco, with headquarters at St. Louis, Mo.

The following officers on the New York Central, Lines West of Buffalo, with headquarters at Cleveland, Ohio, have had their jurisdiction extended to include the Ohio Central Lines: **G. A. Codling,** superintendent freight transportation; **R. P. Gribben,** assistant superintendent freight transportation, and **E. L. Bennett,** superintendent passenger transportation.

R. A. Pierce, general superintendent of the Oregon Short Line, has been appointed superintendent of the Utah division, with headquarters as before at Pocatello, Idaho, following the abolition of the position of general superintendent. Mr. Pierce succeeds **R. E. Brooks,** who has been appointed assistant superintendent of the Utah division, with headquarters at Pocatello, a newly created position. Division superintendents now report directly to the general manager.

C. W. Bearden, general superintendent on the Alton, successor to the Chicago & Alton, has been appointed superintendent of the Eastern division, with headquarters as before at Bloomington, Ill., succeeding **J. J. Butler,** who has been transferred to the Western division, with headquarters at Bloomington. Mr. Butler succeeds **D. J. Deasy,** who has been appointed assistant to the general manager, with headquarters at Chicago. The position of general superintendent has been abolished.

TRAFFIC

S. A. Williams, general freight agent of the Alton, successor to the Chicago & Alton, at Chicago, has been promoted to freight traffic manager at the same point, succeeding **J. A. Behrle,** who has been appointed assistant freight traffic manager, with headquarters also at Chicago. **S. G. Lutz,** chief traffic officer, has retired at his own request and the position of chief traffic officer has been abolished.

ENGINEERING AND SIGNALING

The position of engineer maintenance of way of the Oregon Short Line, which has been held by **L. W. Althof,** with headquarters at Pocatello, Idaho, has been abolished and the duties of the position assumed by **B. H. Prater,** chief engineer at Salt Lake City, Utah.

P. J. McCarthy, acting division engineer on the Kansas City Southern, and acting chief engineer of the Texarkana & Ft. Smith, with headquarters at Texarkana, Tex., has been appointed permanently to those positions.

MOTOR TRANSPORT

Grant Hall has been elected president of the Quebec Central Transportation Company, recently-organized highway subsidiary of the Quebec Central. Other officers are: **J. H. Walsh,** vice-president; **G. D. Wadsworth,** general manager; **H. C. Oswald,** secretary and **A. H. Bradford,** treasurer. All of the foregoing hold similar positions on the parent railroad.

OBITUARY

S. B. Myers, general agent for the Chicago, Indianapolis & Louisville, at Tulsa, Okla., died on August 9.

Edwin H. McHenry, formerly chief engineer of the Northern Pacific, chief engineer of the Canadian Pacific and vice-president of the New York, New Haven & Hartford, died on August 22, at his home in Ardmore, Pa., a suburb of Philadelphia.

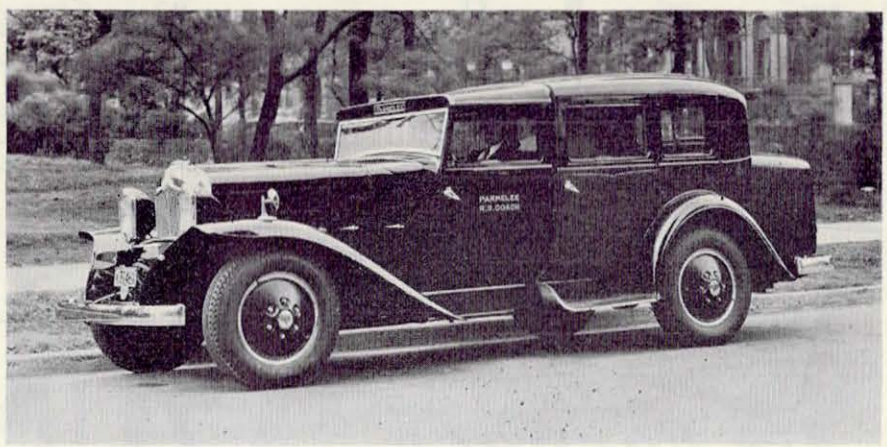
Ira Everett, consulting master car builder of the Lehigh Valley, who died on August 10, began his railroad career with the Lehigh Valley on May 30, 1880, as a laborer at the Packerton car shop, where he held various positions until October 16, 1898, when he became foreman of car inspectors at Allentown, Pa. On September 1, 1902, he returned to the Packerton shop as general foreman, and on October 1, 1911, he was transferred to the Sayre, Pa., shops as assistant shop superintendent. On June 1, 1914, he was promoted to the staff of the superintendent motive power as general car inspector at Bethlehem, Pa., which position he held until July 1, 1928, when he was appointed master car builder. He was employed in a consulting capacity at the time of his death.

James W. Orr, formerly assistant comptroller of the Pennsylvania, who died on August 20, was born in Pittsburgh, Pa., on September 9, 1866, and began his railroad career in October, 1880, as a messenger in the office of the auditor of the Pittsburgh, Cincinnati & St. Louis (now a part of the Pennsylvania). After filling various clerical positions until April 1, 1890, he was appointed general bookkeeper in the office of the comptroller, Pennsylvania lines west of Pittsburgh; became chief clerk to the comptroller on October 1, 1897, and on January 1, 1903, was named general accountant. Subsequent promotion to the position of assistant to

James W. Orr

the comptroller, on April 1, 1905, was followed by further promotion to assistant comptroller on January 1, 1913, and by appointment as comptroller of the lines west on February 1, 1915. During the period of Federal Control, Mr. Orr served the United States Railroad Administration as federal auditor, Pennsylvania Railroad, western lines. On March 1, 1920, when Federal control terminated, he was appointed comptroller, with headquarters at Pittsburgh; and on July 1, 1923, when the accounting department was consolidated at Philadelphia, Pa., he was made assistant comptroller, which position he held until he retired from active service on January 1, 1931.

* * * *



Limousine Coach Used by the Parmelee System in Transferring Passengers Between Railway Stations in Chicago—Built by the Checker Cab Manufacturing Company, Kalamazoo, Mich.

Modern
Passenger Equipment Tends To Increase Passenger Traffic . . . .

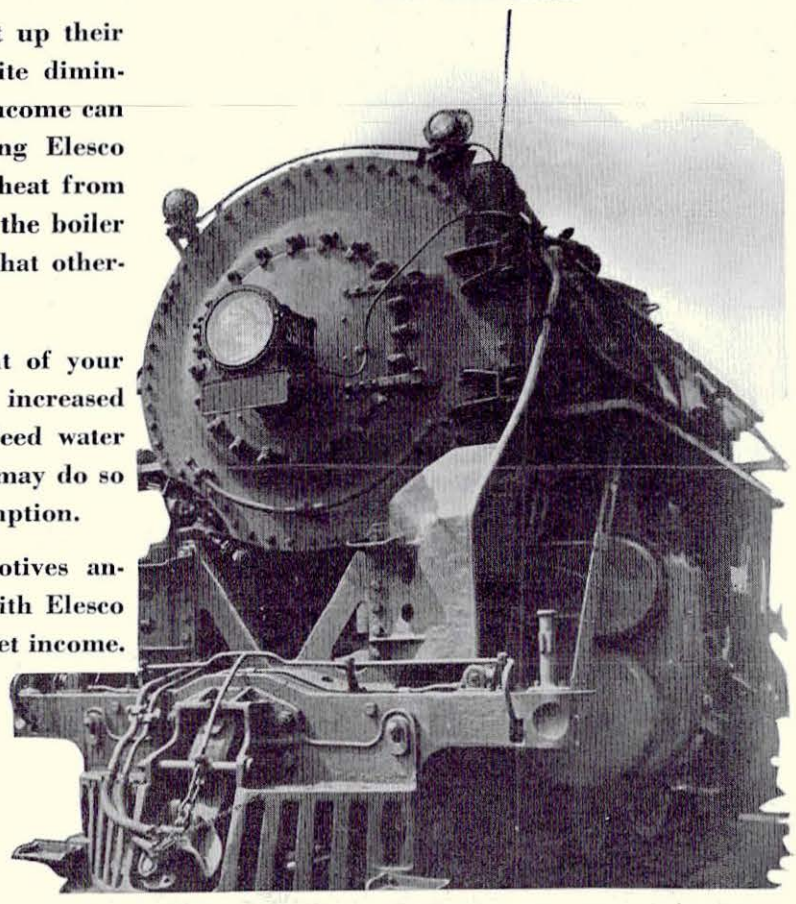
thus increasing gross revenues. Modern power and modernized old power reduce operating costs . . . thus increasing net profits. Yet railroads frequently continue to operate locomotives without modern fuel-saving devices like Elesco feed water heaters.

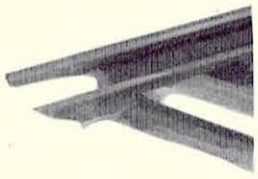
Many of these railroads have kept up their net income surprisingly well despite diminishing gross revenues. Their net income can be increased, however, by applying Elesco feed water heaters, which use the heat from part of the exhaust steam, to heat the boiler feed water. Thus heat is utilized that otherwise would be wasted.

You may thereby save 15 per cent of your fuel. Or, if you prefer to use the increased capacity provided by the Elesco feed water heater to haul more tonnage, you may do so —with no increase in fuel consumption.

Why not give those older locomotives another chance? Modernize them with Elesco feed water heaters—and increase net income.

The *Elesco*
Feed Water Heater





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ELESCO

Peoples Gas Building
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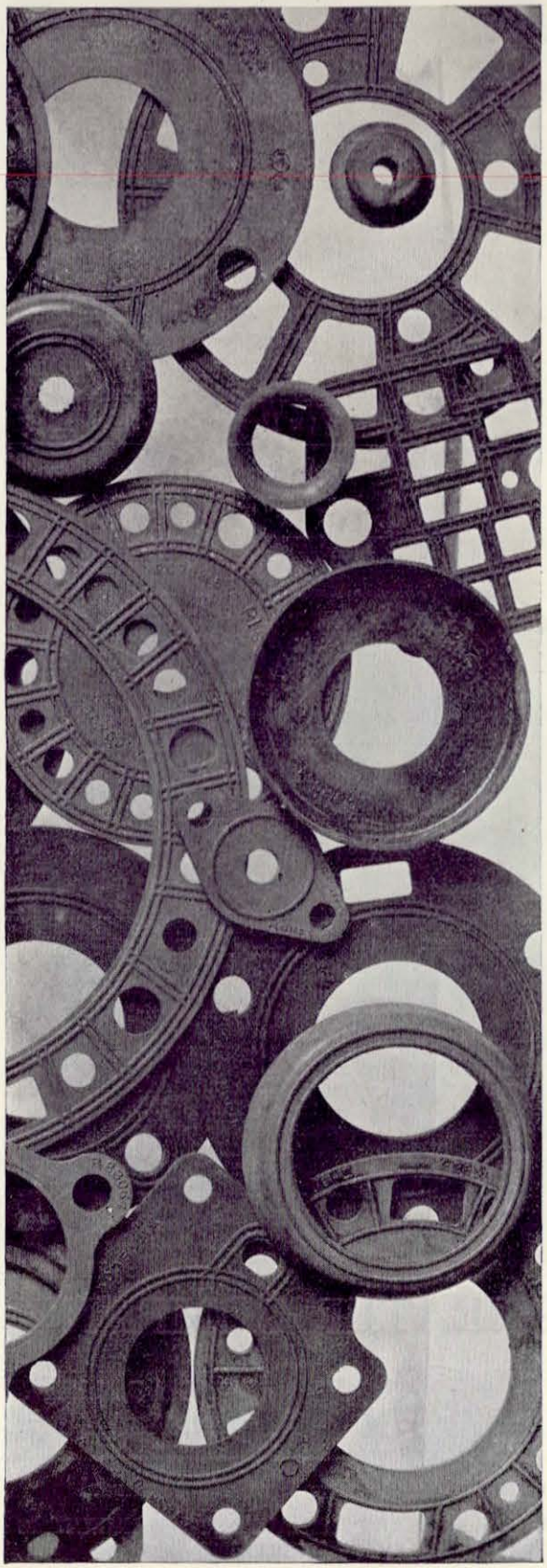
Canada: The Superheater Company, Limited, Montreal

SUPERHEATERS FEED WATER HEATERS EXHAUST STEAM INJECTORS
SUPERHEATED STEAM PYROMETERS

A-633

WABCO



To Make and Hold an Air Tight Seal

IN gasket manufacture, the moulding of a sealing bead that will make and hold an air-tight joint is by no means an easy matter. It has taken many years of research in the design and construction of moulds to perfect those which now produce the perfect beads you find on Wabco Gaskets.

These beads *make* an air-tight joint and *hold* it air-tight during the entire life of the Wabco compound. This compound, as all users know, lives for an unusually long period. It has been specially blended to resist the oil, the heat, and the wear, or any combination of these various destructive factors met with under various conditions.

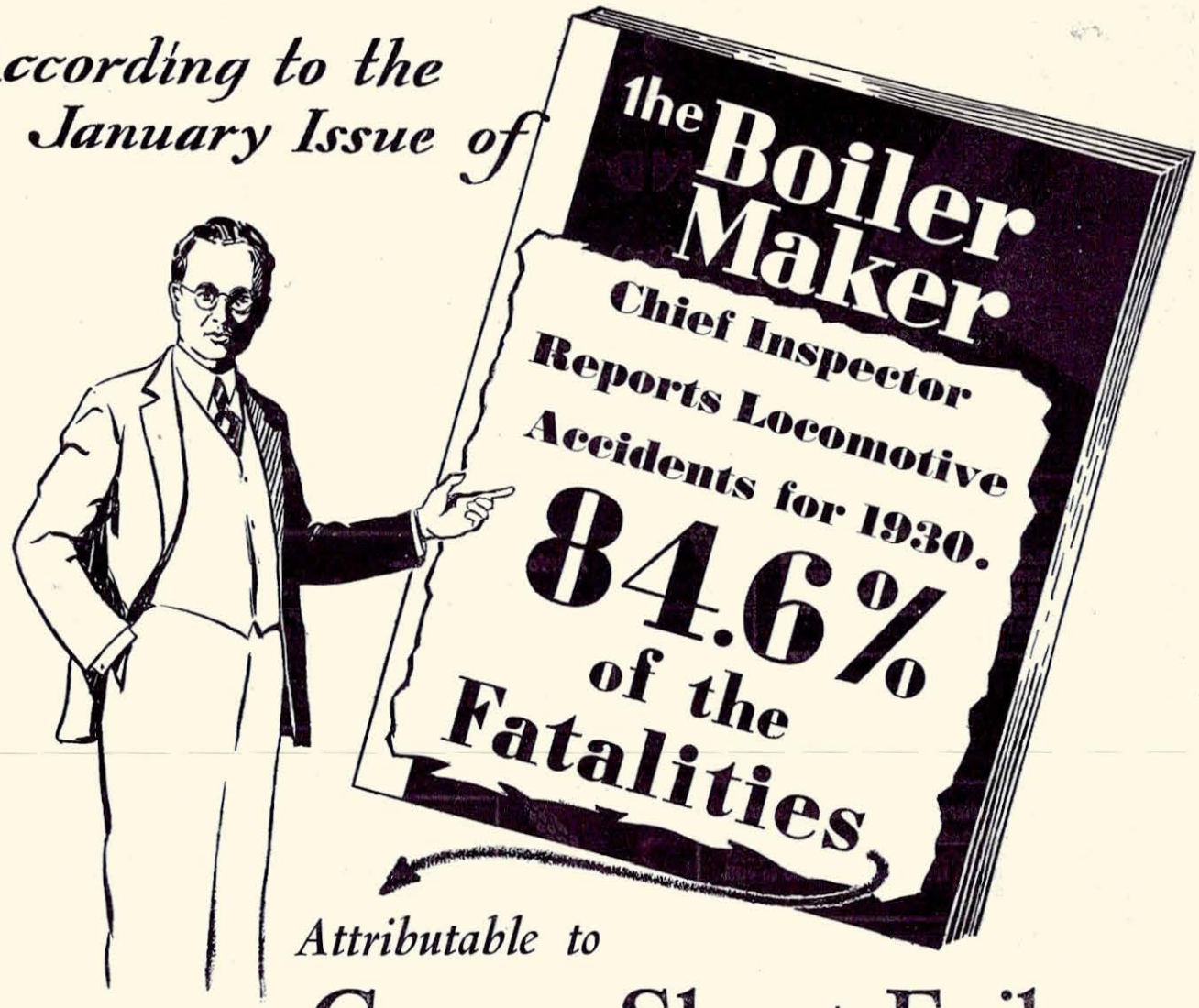
The bead, in other words, is not only accurately moulded but is long preserved by the use of compounds which are calculated to withstand particular conditions. When you apply a Wabco Gasket, therefore, you not only make the tightest seal to start with but insure against the possibility of leakage for the longest period of time.

WESTINGHOUSE AIR BRAKE CO.

GENERAL OFFICE AND WORKS

WILMERDING, PA.

According to the January Issue of



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These horrible disasters can be prevented. The CLEVELAND *Float* Low Water Alarm is positive in its action. It will warn enginemen of a dangerous condition in ample time to protect their lives and your property.

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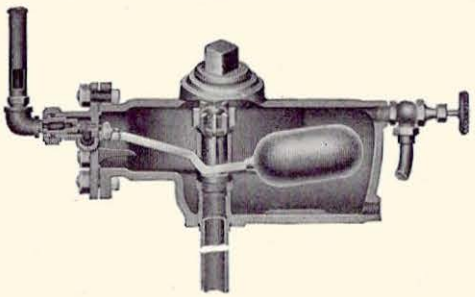
CLEVELAND
Float
Low Water Alarm



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BARCO

MAN, OH MAN, WHAT A BUNCH OF RECORDS! ....AND WHAT RECORDS!

(First Cost) ÷ (Years of Service) = (what pipe costs you). Reading Pipe is *low cost* pipe. Look at these—just a few of the thousands of Puddled Iron Pipe records which prove that Reading Puddled Iron Pipe will cut down your costs year after year by giving you *uninterrupted* pipe service. There's only *one sure* way of getting such service—by looking for the Reading *indented* spiral on every length of pipe you buy, specify or install.

70 Years Young—
And Going Strong!

Since 1861, a Reading Puddled Iron Aqueduct over the Harlem River has been carrying clear, sparkling water! When the bridge was modernized in 1927, the pipe, still perfect, was put back in place!

Buried 30 Years—
Ready for Another 30!

Nobody knows how long the 2" Reading Puddled Iron pipe line of the Danville State Hospital (Danville, Pa.) is going to last! Buried for 30 years, the pipe was still good when the hospital decided to extend the line—so they just joined the extension to the old pipe.

Half a Century? Just an Incident!

For 50 years, Rufus Yost, Reading, Pa., has enjoyed clear spring water from a line of 1¼" Reading Puddled Iron Pipe. The line is still in use—of course!

40 Years in an Ice Plant!

If a flood hadn't destroyed the plant of the Enterprise Ice and Coal Company, Harrison, Tenn., the 40-year-old Reading Puddled Iron Pipe it was using would still be in its service. The pipe's still good . . . even though the plant is gone!

Down in Birmingham, Too

Thirty years of service haven't aged a line of 15" Reading Puddled Iron Pipe, owned by the Birmingham Electric Co., Birmingham, Alabama. Another 20" line used for conveying steam since 1900, is still in excellent condition!

58 Years to Date—
Good for Many More!

Spring Valley Water Company, serving the city of San Francisco, had 58 years of uninterrupted service with its 30" Reading Puddled Iron water main. After cleaning the pipe, the water company found it still serviceable.

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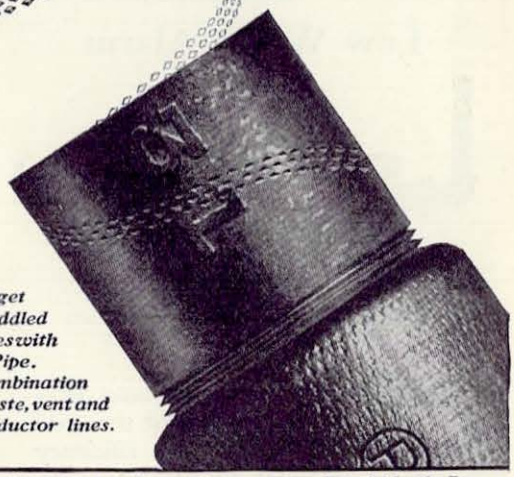

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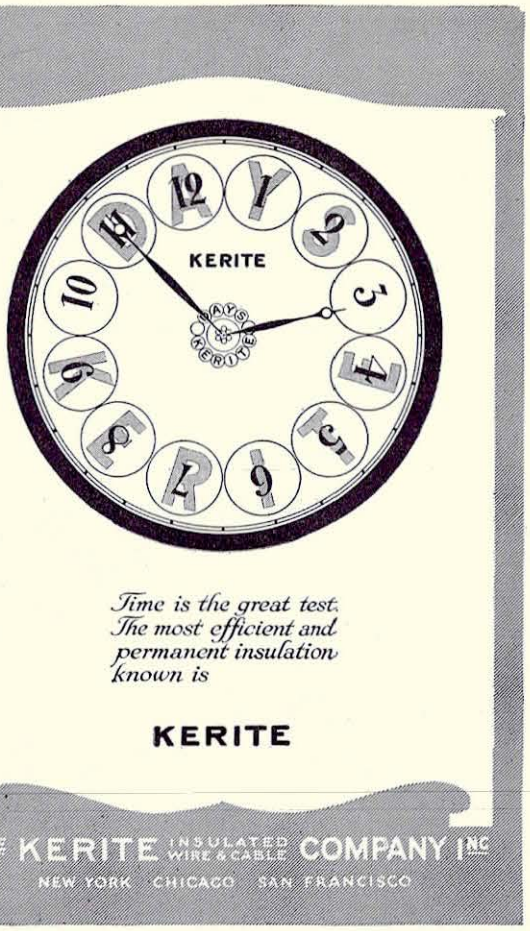

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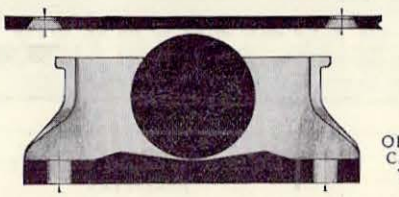

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NEW YORK AND BUFFALO

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Builders of 4v Dump Cars
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For location of advertisements in this issue of manufacturers listed in the Buyers Index, see Advertisers Index on the last page next to cover

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Remington Rand Business Service.

Acetylene, Dissolved.
Oxweld Railroad Service Co., The.

Aftercoolers, Air.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Air Brakes.
New York Air Brake Co.
Westinghouse Air Brake Co.

Aircraft Corrugated Sheet.
Aluminum Co. of America.

Aircraft Extruded & Rolled Shapes.
Aluminum Co. of America.

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Republic Steel Corp.

Air Pumps.
New York Air Brake Co.
Union Asbestos & Rubber Co.
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Air Reservoir Joints—(See Joints, Air Reservoir).

Alloy Steel.
Bethlehem Steel Co.
Illinois Steel Co.
Republic Steel Corp.
Ryerson & Son, Inc., Jos. T.

Alloys, Strong Aluminum.
Aluminum Co. of America.

Angle Bars — (See Joints, Rail).

Angles, Channels and Tees—(See Shapes, Structural).

Anti-Creepers, Rail.
Bethlehem Steel Co.
P. & M. Company, The.

Arch, Locomotive Brick.
American Arch Co., Inc.

Arresters, Lightning.
General Electric Co.
General Railway Signal Co.
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National Bearing Metals Corp.
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Edwards Co., O. M.

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Falls Hollow Staybolt Co.
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American Locomotive Co.
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Buckeye Steel Castings Co.
Gould Coupler Co., The.
Mt. Vernon Car Mfg. Co.
Ohio Steel Foundry Co., The
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Bolts, Track.
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Bonders, Rail.
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Railroad Supply Co.
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American Steel & Wire Co.
Railroad Supply Co.

Bond, Wire Protection.
P & M Co., The.

Boosters, Locomotives.
Franklin Railway Supply Co., Inc.

Boring & Drilling Machines, Horizontal.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Boring Machines, Car Wheel
Sellers & Co., Inc., Wm.

Boring & Turning Mills, Horizontal.
Sellers & Co., Inc., Wm.

Boring & Turning Mills, Vertical.
Sellers & Co., Inc., Wm.

Braces, Rail
Bettendorf Co., The.
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
Q & C Co., The.
Ramapo Ajax Co.
Symington Co., The.

Brake Beam Safety Guards.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.

Brake Beam Supports.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.

Brake Beams.
American Steel Foundries.
Bradford Corporation.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Hunt-Spiller Mfg. Corp.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car. Co.

Brake Drums.
American Car & Foundry Motors Co.
Hunt-Spiller Mfg. Corp.

Brake Forgings, Pins, Levers, etc.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Davis Brake Beam Co.
Mt. Vernon Car Mfg. Co.
Schaefer Equipment Co.

Brakes, Hand.
National Brake Co.

Brake Heads.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Pressed Steel Car Co.

Brake Jaws.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Schaefer Equipment Co.

Brake Shoes.
American Brake Shoe & Foundry Co.
American Steel Foundries.
Brill Co., The J. G.
Buckeye Steel Castings Co.
Fort Pitt Malleable Iron Co.
Mt. Vernon Car Mfg. Co.

Brakes, Air.
General Electric Co.
New York Air Brake Co.
Westinghouse Air Brake Co.

Brakes, Clasp.
American Steel Foundries.

Brakes, Electric.
New York Air Brake Co.
Westinghouse Air Brake Co.

Brakes, Hand.
Miner, W. H.
National Brake Co.
National Malleable & Steel Castings Co.
Wine Railway Appliance Co.

Brass, Sash.
Edwards Co., O. M.

Brick, Locomotive Arch.
American Arch Co., Inc.

Bridge Builders.
American Bridge Co.
Bethlehem Steel Co.

Bridge & Crossing Planks, Treated.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Bridge Flooring.
Carey Co., The, Philip.

Bridge Material, Treated.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Bridge Stringers — (See Stringers, Bridge).

Bronze Powder, Aluminum.
Aluminum Co. of America.

Bucket Handling.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Buckets, Grab.
American Bridge Co.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Buffers, Friction.
Edgewater Steel Co.
Miner, W. H.
Standard Coupler Co.
Westinghouse Air Brake Co.

Buffers, Radial.
Franklin Railway Supply Co., Inc.

Building Materials.
Carey & Co., Philip, The.
Johns-Manville Corp.

Buildings, Iron, Steel and Steel Concrete.
American Bridge Co.
United Engineers & Constructors, Inc.

Bulldozers.
Ryerson & Son, Joseph T.

Buses, Motor.
Reo Motor Car Co.

Cable Accessories, Electrical.
Graybar Electric Co.

Cables, Electric.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Co.
Graybar Electric Co.
Kerite Insulated Wire & Cable Co.

Cableways—(See Tramways).

Caps, Grease.
Prime Mfg. Co., The.

Carbide, Calcium.
Oxweld Railroad Co., The.
Union Carbide Sales Co.

Car Insulation.
Carey & Co., Philip, The.
Wood Conversion Co.

Car Lighting Equipment—(See Lighting, Car Equipment).

Carlines.
Hutchins Car Rfg. Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Car Material, Wood.
Central Coal & Coke Co.

Car Parts and Appliances.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.

Car Parts, Freight.
Bettendorf Co., The.
General American Tank Car Corporation.
Pressed Steel Car Co.

Car Parts, Passenger.
Brill Co., The J. G.
St. Louis Car Co.

Car Repairs.
General American Tank Car Corporation.
Pressed Steel Car Co.
St. Louis Car Co.
Tennessee Coal, Iron & Railroad Co.

Car Retarder Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Car Siding — (See Siding, Car, etc.).

Cars, Baggage.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

Cars, Ballast.
Bethlehem Steel Co.
General American Tank Car Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Caboose, Coal & Stock.
Mt. Vernon Car Mfg. Co.

Cars, Convertible.
Mt. Vernon Car Mfg. Co.

Cars, Dump.
Bethlehem Steel Co.
Bettendorf Co., The.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Flat, Narrow Gauge.
Bettendorf Co., The.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Freight.
Bethlehem Steel Co.
Bettendorf Co., The.
General American Tank Car Corp.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Co.

Cars, Freight (New and Repaired).
Bethlehem Steel Co.
Bettendorf Co., The.
General American Tank Car Corp.
Pressed Steel Car Co.

Cars, Gasoline-Electric.
Brill Co., The J. G.
Electro-Motive Co.
St. Louis Car Co.

Cars, Gasoline Motor.
Brill Co., The J. G.

Cars, Hand & Push.
Fairbanks-Morse & Co.

Cars, Industrial.
Bethlehem Steel Co.
Brill Co., The J. G.
General American Tank Car Corp.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Motor.
Fairbanks-Morse & Co.

Cars, Motor Inspection.
Fairbanks-Morse & Co.

Cars, Oil Electric.
Westinghouse Elec. & Mfg. Co.

Cars, Ore.
Brill Co., The J. G.
General American Tank Car Corp.
Pressed Steel Car Co.

Cars, Passenger.
Bethlehem Steel Co.
Brill Co., The J. G.
Electro-Motive Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.

Cars, Power Units.
Brill Co., The J. G.
Electro-Motive Co.

Cars, Quarry.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Rebuilt and Repaired.
Bettendorf Co., The.
General American Tank Car Corp.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Refrigerator.
General American Tank Car Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Cars, Second-Hand.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Self-Propelled Passenger.
Brill Co., The J. G.
Electro-Motive Co.
General Electric Co.
Pullman Car & Mfg. Corp.
Westinghouse Elec. & Mfg. Co.

Cars, Spreader.
Western Wheeled Scraper Co.

Cars, Tank.
Bethlehem Steel Co.
General American Tank Car Corp.
Indian Refining Co.
Pressed Steel Car Co.

Cars, Dump.
Western Wheeled Scraper Co.

Castings, Alloy Steel.
Symington Co., The.
Union Spring & Mfg. Co.

Castings, Brass and Bronze.
Baldwin Locomotive Works, The.
General Railway Signal Co.
Magnus Co., Inc.
National Bearing Metals Corp.
Union Switch & Signal Co.

Castings, Gray Iron.
American Brake Shoe & Foundry Co.
American Locomotive Co.
Baldwin Locomotive Works.
General Railway Signal Co.
Mt. Vernon Car Mfg. Co.
Ramapo Ajax Corp.
Union Switch & Signal Co.

Castings, Gun Iron.
Hunt-Spiller Mfg. Corp.

Castings, Iron & Steel.
Baldwin Locomotive Works, The.
Industrial Brownhoist Corp.

Castings, Malleable Iron.
Buckeye Steel Castings Co.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
P & M Company, The.
Pressed Steel Car Co.
Symington Co., The.
Universal Draft Gear Attachment Co.

Castings, Monel Metal.
International Nickel Co., The.

Castings, Steel.
Allegheny Steel Co.
American Locomotive Co.
American Steel Foundries.
Bethlehem Steel Co.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Buckeye Steel Castings Co.
General Steel Castings Corp.
Gould Coupler Co., The.
McConway & Torley Co.
Midvale Co., The.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Steel Casting Co.
Universal Draft Gear Attachment Co.

Castings, Steel Loco.
Birdsboro Steel Foundry & Machine Co.
General Steel Castings Corp.
Gould Coupler Co., The.
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Castings, Steel Vanadium.
Birdsboro Steel Foundry & Machine Co.
Brill Co., The J. G.
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Catchbasins, Iron.
Armco Culvert Mfrs. Assoc.

Cellers, Engine Truck.
Ardco Mfg. Co.

Cement Car, Asphalt.
Lehon Co., The.
Sherwin-Williams Co.

Cement, High Temperature.
Carey Co., Philip, The.
Johns-Manville Corp.

Cements, Asbestos and Magnesia.
Carey Co., Philip, The.

Center Plates—(See Bearings, Center).

Center Sills.
Bettendorf Co., The.
Bradford Corporation.

Chain, Monel Metal.
International Nickel Co., The.

Chemicals.
Bird-Archer Co., The.
Dearborn Chemical Co.
Hunt Co., Robert W.

Chemicals, Boiler.
Bird-Archer Co., The.
Dearborn Chemical Co.

Chemicals, Cleaning.
Oakite Products, Inc.

Chemists.
Bird-Archer Co., The.
Dearborn Chemical Co.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Chromium Plating.
Worthington Pump & Machinery Corp.

Chucks, Lathe.
Ryerson & Son, Jos. T.

Cinder Handling Plants.
Roberts & Schaefer Co.

Circuit Breakers.
General Electric Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Clamps, Forging.
Ryerson & Son, Jos. T.

Clamps, Guard Rail.
Q. & C. Co., The.
Westinghouse Air Brake Co.

Clamps, Hose.
Ingersoll-Rand Co.
National Malleable & Steel Castings Co.
Vapor Car Heating & Lighting Co.
Westinghouse Air Brake Co.

Clamps, Pipe.
Franklin Railway Supply Co., Inc.
National Malleable & Steel Castings Co.

Clamps, Rail Cutting.
Oxweld Railroad Service Co., The.

Classification Yard Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Cleaners, Aircraft.
Oakite Products, Inc.

Cleaners, Air Pump.
Oakite Products, Inc.
Westinghouse Air Brake Co.

Cleaners, Bus & Truck.
Oakite Products, Inc.

Cleaners, Car.
Oakite Products, Inc.

Cleaners, Flue.
Ryerson & Son, Jos. T.

Cleaners, General.
Oakite Products, Inc.

Cleaners, Locomotive.
Oakite Products, Inc.

Cleaners, Metal.
Oakite Products, Inc.

Clips, Wire Rope.
American Steel & Wire Co.

Coach and Coach Yard Steam Joints—(See Joints, etc.)

Coaches, Motor.
American Car & Foundry Motors Co.
Dodge Motor Truck Corp.
International Harvester Co.
White Co., The.

Coaches, SecondHand.
Hyman-Michaels Co.

Coal, Ore & Ash Handling Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.
Roberts & Schaefer Co.

Coal Pushers.
Standard Stoker Co.

Coaling Stations.
American Bridge Co.
FairbanksMorse & Co.
Roberts & Schaefer Co.

Cocks, Angle.
Westinghouse Air Brake Co.

Cocks, Blow-Off.
Bird-Archer Co., The.

Cocks, Cylinder.
Prime Manufacturing Co., The.

Columns, Water.
Prime Manufacturing Co., The.

Combination Crane Pile Drivers.
Industrial Brownhoist Corp.

Compounds, Boiler.
Dearborn Chemical Co.
Bird-Archer Co., The.

Compounds, Cleaning.
Oakite Products, Inc.

Compounds, Cutting.
Oakite Products, Inc.

Compounds, Grinding.
Oakite Products, Inc.

Compounds, Paint Removing.
Oakite Products, Inc.

Compounds, Rust Proofing.
Oakite Products, Inc.

Compressors, Air.
Ingersoll-Rand Co.
New York Air Brake Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Concrete Floor Slabs.
Federal American Cement Tile Co.

Concrete Reinforcement.
American Steel & Wire Co.
Carnegie Steel Co.
Ryerson & Son, Jos. T.

Concrete Roofing, Tile.
Federal American Cement Tile Co.

Condensers.
Ingersoll-Rand Co.

Condensing Apparatus.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Conduit, Rigid.
Aluminum Co. of America.

Conduits, Metallic Flexible.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Graybar Electric Co.
Vapor Car Heating Co., Inc.

Conduit, Underground.
Graybar Electric Co.
Johns-Manville Corp.

Connections, Lever.
National Malleable & Steel Castings Co.

Connections, Truck.
National Malleable & Steel Castings Co.

Connections, Truck Lever.
Schaefer Equipment Co.

Contraction Joint.
General Railway Signal Co.

Control Devices, Train Speed.
Union Switch & Signal Co.

Control, Locomotive.
Valve Pilot Co.

Controllers, Electric.
General Electric Co.
Westinghouse Electric & Mfg. Co.

Conveying Machinery.
American Bridge Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Corrugated Sheet.
Aluminum Co. of America.

Conveyor, Ash—(See Coal, Ore and Ash Handling Mach.).

Coupler Pockets—(See Draft Yokes).

Coupler Yokes.
Bettendorf Co., The.
Gould Coupler Co.
Symington Co., The.

Couplers.
American Steel Foundries.
Buckeye Steel Castings Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
McConway & Torley Co.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Westinghouse Air Brake Co.

Couplings, Hose.
Fort Pitt Malleable Iron Co.
Gold Car Heating & Lighting Co.
Ingersoll-Rand Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co.

Cranes, Ballast Cleaning.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Barge.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Bracket.
Shephard-Niles Crane & Hoist Corp.

Cranes, Crawler.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Cranes, Crawling Shovels and Draglines.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Cranes, Diesel.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Electric Traveling.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Gantry.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.
Shephard-Niles Crane & Hoist Corp.

Cranes, Gasoline.
Industrial Brownhoist Corp
Ohio Locomotive Crane Co

Cranes, Grab Bucket.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Handpower.
Industrial Brownhoist Corp
Shephard-Niles Crane & Hoist Corp.

Cranes, Jib.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Worthington Pump & Machinery Corp.

Cranes, Locomotive.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.

Cranes, Overhead.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Pillar.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Portable.
Orton Crane & Shovel Co.

Cranes, Transfer.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Traveling.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Wharf.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Wrecking.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Crank Pins — (See Pins, Crank).

Creosote.
American Creosoting Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
International Creosoting & Constr. Co.
National Lumber & Creosoting Co.

Creosote, Wood Preservative Treatment.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
National Lumber & Creosoting Co.

Cribbing Units.
Federal American Cement Tile Co.

Cross Arms, Treated.
American Creosoting Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
Graybar Electric Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Cross Ties, Treated.
American Creosoting Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Cross Ties, Steel.
Bethlehem Steel Co.

Crossheads & Shoes.
Baldwin Locomotive Wks.
Barco Mfg. Co.
International Creosoting & Construction Co.

Crossing Signals & Signs.
Railroad Supply Co.

Crossings—(See Frogs and Crossings).

Crossings, Pavement.
Carey Co., The Philip.

Crushers, Coal.
American Sheet & Tin Plate Co.
Orton Crane & Shovel Co.

Culverts.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.
Toncan Culvert Manufacturers' Association.

Culverts, Corrugated Iron
Armco Culvert Manufacturers' Association.
Republic Steel Corp.

Culverts, Part Circle
Armco Culvert Manufacturers Association

Culverts, Treated.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Cups, Oil.
New York Air Brake Co.
Prime Manufacturing Co., The.
Westinghouse Air Brake Co.

Curtain Material, Car.
Ryerson & Son, Jos. T.

Curtains, Cab.
Lehon Co., The.

Cutting and Welding Apparatus.
Electric Railweld Service Corp.
Oxweld Railroad Service Co.
Westinghouse Electric & Mfg. Co.

Cut-Off Indicators and Recorders.

Cylinder Parts, Finished and Rough.
National Tube Co.
Valve Pilot Co.

Cylinders, Air Brake.
Westinghouse Air Brake Co.

Cylinders, Cast Steel Locomotive.
General Steel Castings Corp.
Union Steel Casting Co.

Cylinders, Oxy-Acetylene.
Oxweld Railroad Co., The.

Deoxidizers.
Q & C Co., The.
Vanadium Corp. of America.

Derricks.
Industrial Brownhoist Corp.

Diesel Electric Power Plants.
Fairbanks-Morse & Co.
Westinghouse Elec. & Mfg. Co.

Dirt Collectors.
New York Air Brake Co.
Westinghouse Air Brake Co.

Disinfectants.
West Disinfecting Co.

Dispatching Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Ditching Machinery.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Door Fixtures — (See Fixtures, Car Door).

Doors, Car.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
Wine Railway Appliance Co.

Doors, Locomotive Firebox.
Franklin Railway Supply Co., Inc.

Doors, Rolling, Steel.
Kinnear Mfg. Co.

Draft Arms.
American Steel Foundries.
Birdsboro Steel Foundry & Machine Co.
Bradford Corporation.
Symington Co., The.
Universal Draft Gear Attachment Co.

Draft Gear Attachments.
Symington Co., The

Draft Gears.
American Steel Foundries.
Bradford Corporation.
Cardwell-Westinghouse Co.
Edgewater Steel Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Union Draft Gear Co.
Universal Draft Gear Attachment Co.

Draft Yokes.
American Steel Foundries.
Bettendorf Co., The.
Buckeye Steel Castings Co.
Gould Coupler Co., The.
McConway & Torley Co.
Miner, W. H.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Steel Car Forge Co.
Symington Co., The.
Universal Draft Gear Attachment Co.

Drainage Gates, Automatic
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Drains, Perforated Iron.
Republic Steel Corp.

Drawbar Centering Device.
Gould Coupler Co., The.
Miner, W. H.

Drawbars, Unit Safety.
Franklin Railway Supply Co., Inc.
Industrial Brownhoist Corp.

Dredging Machinery.
Industrial Brownhoist Corp.

Drilling Machines.
Sellers & Co., Inc., Wm.

Drilling Machines, Bonding.
Railroad Supply Co.

Drilling Machines, Pneumatic
Ingersoll-Rand Co.

Drilling Machines, Rock.
General Electric Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drilling Machines, Upright and Radial.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Drills.
Ingersoll-Rand Co.

Drills, Close Corner.
Ingersoll-Rand Co.

Drills, Concrete.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drills, Steel Rock and Steel Sharpened.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drills, Track & Bending.
Bird-Archer Co., The.
Ingersoll-Rand Co.

Drive Gas Electric Coaches.
General Electric Co.

Drive Gas Electric Locomotives
Westinghouse Electric & Mfg. Co.

Driving Boxes (Extended Main).
Franklin Railway Supply Co., Inc.

Drop Door Mechanism.
Wine Railway Appliance Co.

Dynamos—(See Generators, Electric).

Electrical Cable Accessories.
General Electric Supply Corp.

Electric Cables.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Supply Corp.

Electrical Instruments.
Electric Service Supplies Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Electrical Supplies.
General Electric Co.
General Electric Supply Corp.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Electrification, Railroad.
Battey & Kipp.
General Electric Co.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

Electric Heaters.
General Electric Supply Corp.

Electrical Insulation.
General Cable Corp.
General Electric Supply Corp.

Electrical Porcelain Insulators.
General Electric Supply Corp.

Electric Motors.
General Electric Supply Corp.

Electric Rivet Heaters.
General Electric Supply Corp.

Electric Switches.
General Electric Supply Corp.

Enamels.
Lowe Bros. Co., The.
Sherwin-Williams Co.

End Frames, Cast Steel, Passenger Car.
General Steel Castings Corp.

Ends, Steel.
Hutchins Car Rfg. Co.
Union Metal Products Co.

Engineers, Consulting, Civil, Elec., Hydraulic. Mechanical.
Battey & Kipp.
Hunt Co., Robt. W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

Engineers, Contracting.
Battey & Kipp.
United Engineers & Constructors, Inc.

Engineers and Contractors.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

Engineers, Construction.
Battey & Kipp.
Roberts & Schaefer Co.
United Engineers & Constructors, Inc.

Engineers and Contractors, Elec., Hydraulic, Mech.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
Roberts & Schaefer Co.

Engineers, Inspecting.
Gulick-Henderson Co.
Hunt Co., Robert W.
Muhlfeld, John E.
Pittsburgh Testing Laboratory.
United Engineers & Constructors, Inc.

Engineers, Valuation.
Hunt Co., Robert W.
United Engineers & Constructors, Inc.

Engines, Crude & Fuel Oil.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Engines, Diesel.
Worthington Pump & Machinery Corp.

Engines, Gas.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

Engines, Gas & Gasoline.
[illegible]can Car & Foundry Motors Co.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Engines, Hoisting.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Excavators.
Industrial Brownhoist Corp.

Exhaust & Heater Pipe.
Union Asbestos & Rubber Co.

Exhaust & Ventilating Fans.
General Electric Supply Corp.

Expanders, Tube.
Ryerson & Son, Joseph T.

Fans, Exhaust & Ventilating.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Fasteners, Car Door.
Camel Sales Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.

Feed Water Heater Systems.
Bird-Archer Co., The.
Coffin, Jr., Co., The J. S.
Worthington Pump & Machinery Corp.

Fencing Wire—(See Wire, Fence).

Fence Posts, Treated.
American Steel & Wire Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Ferro Alloys.
Vanadium Corp. of America.

Ferro, Chromium.
Vanadium Corp. of America.

Ferro, Molybdenum.
Electro Metallurgical Sales Corp.
Vanadium Corp. of America.

Ferro, Silicon.
Vanadium Corp. of America.

Ferro, Tungsten.
Vanadium Corp. of America.

Ferro, Vanadium.
Vanadium Corp. of America.

Filters, Air.
New York Air Brake Co.
Westinghouse Air Brake Co.

Filters, Water & Industrial.
Graver Tank & Mfg. Corp.

Filtration Plants (Water).
Graver Tank & Mfg. Corp.

Fireboxes.
American Locomotive Co.
Baldwin Locomotive Works

Fire Fighting & Protection Equipment.
Johns-Manville Corp.

Fittings, Air Brakes.
Westinghouse Air Brake Co.

Fittings, Steam.
Vapor Car Heating Co., Inc.

Fixtures, Car Door.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
National Malleable & Steel Castings Co.

Flangers, Snow.
Q & C Co., The.

Floodlights.
General Electric Supply Corp.
Graybar Electric Co.
Oxweld Railroad Service Co.
Pyle-National Co.
Symington Co., The.
Westinghouse Elec. & Mfg. Co.

Floodlights, Acetylene.
Oxweld Railroad Service Co., The.

Flooring.
Carey & Co., Philip, The.
Johns-Manville Corp.

Flooring, Car.
Tuco Products Corp.

Flooring, Coach.
Tuco Products Corp.

Flooring, Composition.
Johns-Manville Corp.
Tuco Products Corp.

Flooring, Treated.
Central Coal & Coke Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
National Lumber & Creosoting Co.

Floor Plates, Steel.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Company

Floor Slabs, Concrete.
American Cement Tile Mfg. Co.

Flue Cleaners—(See Cleaners, Flue).

Flue Cutters—(See Cutters, Flue).

Flues, Boiler—(See Tubes, Boiler).

Flue Shop Equipment.
Ryerson & Son, Joseph T.

Forges, Rivet Heating.
Ryerson & Son, Joseph T.

Forging Hammers.
Industrial Brownhoist Corp.

Forgings.
American Bridge Co.
American Steel Foundries
Baldwin Locomotive Works, The.
Bethlehem Steel Co.

Brill Co., The J. G.
Carnegie Steel Co.
Edgewater Steel Co.
General Railway Signal Co.
Gould Coupler Co., The.
Illinois Steel Co.
Midvale Co., The.
Mt. Vernon Car Mfg. Co.
Neely Nut & Bolt Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Steel Car Forge Co.
Universal Draft Gear Attachment Co.

Forgings, Drop.
Baldwin Locomotive Works, The.
Brill Co., The J. G.
General Railway Signal Co.
Steel Car Forge Co.
Union Switch & Signal Co.

Forgings, Monel Metal.
International Nickel Co., The.

Foundry Supplies.
Bird-Archer Co., The.

Frames, Cast Steel Locomotive
General Steel Castings Corp.

Frames, Locomotive.
American Steel Foundries.
American Locomotive Co.
Baldwin Locomotive Works.
Birdsboro Steel Foundry & Machine Co.
Ohio Steel Foundry Co., The.
Union Steel Casting Co.

Frames, Truck.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works
Bettendorf Co., The.
Birdsboro Steel Foundry & Machine Co.
Buckeye Steel Castings Co.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
Ohio Steel Foundry Co., The.
Pressed Steel Car Co.
Pyle-National Co.
Symington Co., The.

Frames, Vanadium.
American Locomotive Co.
Baldwin Locomotive Works
Birdsboro Steel Foundry & Machine Co.
Union Steel Casting Co.

Frogs and Crossings.
Bethlehem Steel Co.
Ramapo Ajax Corp.

Fulcrums, Brake Beam.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
National Malleable & Steel Castings Co.

Furnaces, Electric.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Furnaces, Gasoline.
Railroad Supply Co.

Furnaces, Rivet Heating—(See Forges, Rivet Heating).

Furniture.
Aluminum Co. of America

Gage Testers—(See Testers, Gage).

Gages, Air.
Westinghouse Air Brake Co.

Gages, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Gages, Steam.
Ashton Valve Co.

Gages, Tire.
Schrader's Son, Inc., A.

Gages, Wheel Press Recording.
Ashton Valve Co.

Gaskets.
Westinghouse Air Brake Co.

Gasoline.
Ethyl Gasoline Corp.

Gear Blanks, Rolled Steel.
Edgewater Steel Co.
Standard Steel Works Co.

Gears and Pinions.
American Steel Foundries.
Westinghouse Elec. & Mfg. Co.

Gears, Silent.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Gears, Valve — (See Valve Gears).

Generators, Acetylene.
Oxweld Railroad Service Co.

Generators, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Sunbeam Electric Mfg. Co
Westinghouse Elec. & Mfg. Co.

Goggles, Welding.
Oxweld Railroad Service Co., The.
Sunbeam Electric Mfg. Co.

Graders, Elevating.
Western Wheeled Scraper Co.

Grapples, Wood.
Industrial Brownhoist Corp.

Grate Bars.
Q & C Co., The.

Grate Shakers, Automatic.
Franklin Railway Supply Co., Inc.

Grates.
Firebar Corp.

Grease Forming Machines.
Franklin Railway Supply Co., Inc.

Grey Iron.
American Brake Shoe & Foundry Co.

Grinders, Internal.
Micro Machine Co.

Grinders, Portable Crank Pin.
Micro Machine Co.

Grinding Machines.
Sellers & Co., Inc., Wm.

Grinding Machines, Portable.
Ingersoll-Rand Co.
Ryerson & Son, Inc., Joseph T.

Guard Rails, Treated.
Curtin-Howe Corp.
International Creosoting & Construction Co.

Guard Rails, Foot Guard.
Q & C Co., The.

Guard Rails (One Piece).
Bethlehem Steel Co.
Ramapo Ajax Corp.

Guard Switch Point.
Q & C Co., The.

Guards, Cattle.
American Bridge Co.

Guards, Dust.
Gould Coupler Co., The.
Symington Co., The.

Hair Felt.
Johns-Manville Corp.

Hammers, Pneumatic.
Ingersoll-Rand Co.

Hammers, Riveting.
Ingersoll-Rand Co.

Hammers, Steam.
Industrial Brownhoist Corp.
Sellers & Co., Inc., Wm.

Hand Brakes—(See Brakes, Hand).

Hangers, Ball Bearing.
S. K. F. Industries, Inc.

Hand Rails & Fittings.
Aluminum Co. of America.

Hangers, Bottom Rod Safety.
Chicago Railway Equipment Co.

Hangers, Car Door—(See Fixtures, Car Door).

Headgates, Sliding
Armco Culvert Manufacturers Association

Headlight Repair Parts, Electric.
Electric Service Supplies Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

Headlights, Electric.
General Electric Co.
Pyle-National Co., The.
Sunbeam Electric Mfg. Co.
Westinghouse Electric & Mfg. Co.

Headlights, Reflectors & Cases.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

Heaters, Electric.
Gold Car Heating & Lighting Co.
Westinghouse Electric & Mfg. Co.

Heaters, Feedwater.
Graver Tank & Mfg. Corp.

Heaters, Feedwater Locomotive.
Coffin Co., Jr., The J. S.
Superheater Company, The.
Worthington Pump & Machinery Corp.

Heaters, Feed Water, Stationary.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

Heating & Ventilating Apparatus.
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.
Westinghouse Electric & Mfg. Co.

Heating Equipment, Car.
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

Heating Systems, Car (Electric and Steam).
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

High Temperature Cements.
Carey & Co., Philip, The.

Highway Crossing Protection Devices.
American Bridge Co.
Franklin Railway Supply Co., Inc.
Griswold Signal Co.
Railroad Supply Co.

Hoists, Chain.
Milwaukee Electric Crane & Hoist Corp.
Ryerson & Son, Jos. T.

Hoists, Electric.
Milwaukee Electric Crane & Hoist Corp.

Hoists, Pneumatic.
Ingersoll-Rand Co.

Hoisting Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Hooks, Wrecking.
National Malleable & Steel Castings Co.

Horns, Pneuphonic.
Westinghouse Air Brake Co.

Hose, Air, Steam, Etc.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Hose, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Hose, Tender.
Westinghouse Air Brake Co.

Incandescent Lamps.
General Electric Supply Corp.

Indicators, Speed & Cut-off.
Valve Pilot Co.

Ingots.
Birdsboro Steel Foundry & Machine Co.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
McConway & Torley Co.
Standard Steel Works Co.

Injectors, Exhaust Steam.
Sellers & Co., Inc., Wm.
Superheater Co., The.

Inspection of Material and Equipment—(See Engineers, Inspection).

Insulated Wire.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Supply Corp.

Insulation, Car.
Carey Co., Philip, The.
Wood Conversion Co.

Insulation, Car, Bldg.
Carey Co., Philip, The.
JohnsManville Corp.
Lehon Co., The.
Tuco Products Corp.
Union Asbestos & Rubber Co.
Wood Conversion Co.

Insulation, Electrical.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Insulation, Exhaust & Heater Pipe.
Carey Co., Philip, The.
Johns-Manville Corp.
Tuco Products Corp.
Union Asbestos & Rubber Co.

Insulation, Heat.
Carey Co., Philip, The.
Miner, W. H.

Insulation Tape.
General Electric Supply Corp.

Insulators, Electrical, Porcelain.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Interlocking Plant Equipment.
General Railway Signal Co.
Union Switch & Signal Co.

Iron Chain.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Ryerson & Son, Joseph T.

Iron, Charcoal.
Bethlehem Steel Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Ryerson & Son, Joseph T.

Iron, Engine Bolt.
Lockhart Iron & Steel Co.
Ryerson & Son, Joseph T.

Iron, Forging Billets.
Lockhart Iron & Steel Co.

Iron, Hollow Staybolt.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Hollow Staybolt Bars.
Bethlehem Steel Co.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Pig.
Bethlehem Steel Co.

Iron, Refined.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Iron, Staybolt — (See also Staybolts).
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Reading Iron Co
Ryerson & Son, Joseph T.

Jacking, Locomotive.
Carey Co., Philip, The.

Jacking Method of Installing Pipe
Armco Cuvert Manufacturers Association

Jacks, Smoke.
Carey Co., Philip, The.
Johns-Manville Corp.

Joints, Air Reservoir.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Blow Off Line (Roundhouse).
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Coach and Coach Yard.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Flexible.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

Joints, Flexible Ball.
Barco Mfg. Co.

Joints, Rail.
American Steel Foundries.
Carnegie Steel Co.
Illinois Steel Co.
Q & C Co., The.
Rail Joint Co.
Union Switch & Signal Co.

Joints, Steam, Air & Liquid.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

Joints, Swing.
Barco Mfg. Co.
Vapor Car Heating Co., Inc.

Journal Boxes and Lids.
Allegheny Steel Co.
American Steel Foundries.
Brill Co., The J. G.
Gould Coupler Co., The.
Hunt-Spiller Mfg. Corp.
National Malleable & Steel Castings Co.
Pullman Car & Mfg. Corp.
Railway Steel Spring Co.
Symington Co., The.
Union Spring & Mfg. Co.

Journal Oilers, Car & Locomotive.
Ardco Mfg. Co.

Keys, Brake Shoe.
Bradford Corporation.
Buffalo Brake Beam Co.
Mt. Vernon Car Mfg. Co.
Steel Car Forge Co.
Union Spring & Mfg. Co.

Knuckles, Emergency.
Q & C Co., The.

Laboratories, Testing.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Lacquers.
General Electric Supply Corp.
Sherwin-Williams Co.

Ladders, Steel Car.
Wine Railway Appliance Co.

Lagging, Locomotive.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lamps, Incandescent.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lamps, Inspector's.
Oxweld Railroad Service Co., The.

Lath, Metal
Armco Railroad Sales Co.

Lathes, Axle.
Sellers & Co., Inc., Wm.

Lathes, Engine.
Ryerson & Son, Joseph T.

Lathes, Wheel.
Sellers & Co., Inc., Wm.

Lead, White.
National Lead Co.

Lighting Equipment, Car.
Electric Storage Battery Co.

Lighting Fixtures and Systems.
General Electric Supply Corp.
Graybar Electric Co.
Pyle-National Co.

Lighting Plants, Gas, Electric
Pyle-National Co., The.
Sunbeam Electric Mfg. Co

Lightning Arresters.
General Electric Supply Corp.

Line Material.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lock Nuts—(See Nut Locks)

Locomotive Jacket Sheets.
Armco Railroad Sales Co.

Locomotive Water Conditioners
Bird-Archer Co., The.

Locomotives, Contractors.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Electric.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Locomotives, Gasoline.
Baldwin Locomotive Works.

Locomotives, Gas-Electric.
Brill Co., The J. G.
Electro-Motive Co.

Locomotives, Geared.
Lima Locomotive Works.

Locomotives, Industrial.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Mine.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Oil Engine, Electric Driven.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.
Whitcomb Co., Geo. D. The.

Locomotives, Rebuilt.
American Locomotive Co.

Locomotives, Repair Parts.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Steam.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotive Stokers.
Standard Stoker Co.

Locomotive Valve Pilot.
Valve Pilot Co.

Lubricators, Driving Box.
Franklin Railway Supply Co., Inc.

Lubricators, Piston Rod.
Q & C Co., The.

Lumber, Asbestos.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lumber, Treated.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
Industrial Lumber & Creosoting Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Machinery, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Machine Screws, Monel Metal
International Nickel Co., The.

Magnets, Lifting.
Industrial Brownhoist Corp.
Electro Metallurgical Sales Corp.

Mechanical Draft Apparatus—(See Heating and Vent. App.).

Mechanical Stokers.
Standard Stoker Co.

Melters, Snow, Electric.
Q & C Co., The.

Metallic Flexible Conduit.
General Electric Supply Corp.

Meters, Water & Oil.
Worthington Pump & Machinery Corp.

Milling Machines, Planer Type.
Sellers & Co., Inc., Wm.

Milling Machines, Plain and Universal.
Ryerson & Son, Joseph T.

Milling Machines, Portable Frame Jaw.
Micro Machine Co.

Mohair Upholstery Velvets.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Molybdenum Metal.
Vanadium Corp. of America.

Monel Metal, Rods, Sheets, Tubes, Wire, etc.
International Nickel Co., The.

Motors, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Motors & Generators.
Fairbanks-Morse & Co.

Moulding.
Aluminum Co. of America.

Multiple V Belt Drives.
Worthington Pump & Machinery Corp.

Nails.
American Steel & Wire Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Nipples, Air Hose.
Prime Manufacturing Co.

Nozzles, Exhaust.
Franklin Railway Supply Co., Inc.

Nozzles, Oxy-Acetylene Cutting.
Oxweld Railroad Service Co., The.

Nuts—(See Bolts and Nuts).

Nut Locks.
Dardelet Threadlock Corp.
Grip Nut Co.

Nuts, Tank Hose.
Prime Manufacturing Co., The.

Office Appliances.
Remington-Rand Business Service.

Oils, Diesel Engine
Vacuum Oil Co.

Oil, Dynamo
Vacuum Oil Co.

Oil-Electric Locomotives.
American Locomotive Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.

Oil Filtering & Storage Systems.
Graver Tank & Mfg. Corp.

Oils & Greases, Engine
Vacuum Oil Co.

Oils & Greases, Lubricating
Vacuum Oil Co.

Oils & Greases, Motor
Vacuum Oil Co.

Oil, Linseed.
National Lead Co.

Oils, Locomotive Valve
Vacuum Oil Co.

Oil Plugs, Steam Chest.
Franklin Railway Supply Co., Inc.

Oil, Turbine
Vacuum Oil Co.

Oxy-Acetylene Apparatus.
Oxweld Railroad Service Co., The.

Oxygen.
Oxweld Railroad Service Co., The.

Packing.
Westinghouse Air Brake Co.

Packing, Air Pump.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.
Westinghouse Air Brake Co.

Packing, Asbestos.

Packing, Cylinder and Valve Ring.
Johns-Manville Corp.
Hunt-Spiller Mfg. Corp.
Westinghouse Air Brake Co.

Packing, Locomotive Cab Cock.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Ring Boiler.
Union Asbestos & Rubber Co.

Packing, Semi-Metallic.
Pilot Packing Co.
Central Alloy Steel Corp.

Packing, Sheet.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Soft.
Carey & Co., Philip, The.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.

Packing, Throttle.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Paint Burners, Acetylene.
Oxweld Railroad Service Co., The.

Paint, Metal Protective.
Lowe Bros. Co., The.
National Lead Co.
Sherwin-Williams Co.

Paint, Powder.
Aluminum Co. of America.

Paint Spraying Equipment.
De Vilbiss Mfg. Co., The.

Paints.
Lowe Bros. Co., The.
National Lead Co.
Sherwin-Williams Co.

Paper, Carbon.
Remington-Rand Business Service.

Paper, Sheathing.
Carey & Co., Philip, The.

Patterns, for Iron, Steel & Brass Castings.
Baldwin Locomotive Works, The.

Pavement Breakers.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Pickling Equipment, Monel Metal.
International Nickel Co., The.

Pile Drivers.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Piling, Treated.
American Creosoting Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Piling, Sheet Steel.
American Bridge Co.
Carnegie Steel Co.
Inland Steel Company

Pilot Beams, Cast Steel.
General Steel Castings Corp.
Gould Coupler Co., The.

Pilots, Cast Steel.
General Steel Castings Corp.
Locomotive Finished Material Co.

Pins, Air Brake & Clevis.
Champion Rivet Co.

Pins, Center.
Miner, W. H.

Pins, Coupler Knuckle.
Champion Rivet Co.
McConway & Torley Co.
National Malleable & Steel Castings Co.

Pins, Crank.
American Locomotive Co.
Baldwin Locomotive Works.
Miner, Inc., W. H.
Standard Steel Works Co.
Union Asbestos & Rubber Corp.

Pipe, Corrugated Iron
Armco Culvert Manufacturers Association

Pipe, Paved Invert
Armco Culvert Manufacturers Association

Pipe Coverings.
Carey & Co., Philip, The.
Johns-Manville Corp.
Keasby & Mattison Co.

Pipe Fittings—(See Fittings, Pipe).

Pipe, Metal Culvert.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Republic Steel Corp.

Pipe, Perforated Iron
Armco Culvert Manufacturers Association

Pipe, Spiral Welded.
Armco Railroad Sales Co

Pipe, Steel Signal.
National Tube Co.

Pipe, Spiral Welded.
Armco Railroad Sales Co

Pipe, Wrought Iron.
Byers Co., A. M.
Reading Iron Co.

Planers, Plate.
Ryerson & Son, Jos. T.
Sellers & Co., Inc., Wm.

Plates.
Steel Car Forge Co.

Plates, Follower.
Steel Car Forge Co.

Plates, Boiler, Firebox—(See Steel Firebox).

Plates, Center—(See Bearings, Center).

Plates, Iron & Steel.
Armco Railroad Sales Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Plate & Sheet Metal Work.
Baldwin Locomotive Works, The.

Plates, Tie.
Illinois Steel Co.
Inland Steel Company.
Railroad Supply Co.
Tennessee Coal, Iron & Railroad Co.

Plates, Tin and Terne.
American Sheet & Tin Plate Co.

Platforms, Car.
Gould Coupler Co., The.
Standard Coupler Co.

Platforms, Cast Steel, Passenger Car.
General Steel Castings Corp.

Plows, Railroad and Grading.
Western Wheeled Scraper Co.

Plows, Snow.
American Locomotive Co.
Brill Co., The J. G.
Q & C Co., The.

Plush, Mohair.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Pneumatic Tools.
Ingersoll-Rand Co.

Poles, Signal.
American Creosoting Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
General Railway Signal Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.
Union Switch & Signal Co.

Poles, Treated.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
General Electric Supply Corp.
Curtin-Howe Corp.
Graybar Electric Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Poles, Steel Tubular.
Graybar Electric Co.
National Tube Co.

Posts, Fence, Treated.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
Inland Steel Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Posts, Steel Fence.
American Steel & Wire Co.
Q & C Co., The.

Powder, Blasting—(See Explosives).

Powdered Coal Equipment.
Muhlfeld, John E.

Power Plants.
General Electric Co.
Muhlfeld, John E.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

Power Transmission Supplies.
Sellers & Co., Inc., Wm.

Preservatives, Wood.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
National Lumber & Creosoting Co.

Presses, Flanging Hydraulic.
Birdsboro Steel Foundry & Machine Co.

Presses, Hydraulic.
Baldwin-Southwark Corp.
Birdsboro Steel Foundry & Machine Co.

Presses, Wheel.
Birdsboro Steel Foundry & Machine Co.
Sellers & Co., Inc., Wm.

Pulverizers, Coal — (See Crushers, Coal).

Pumping Stations.
Fairbanks-Morse & Co.

Pump Liners, Monel Metal.
International Nickel Co., The.

Pump Rods, Monel Metal.
International Nickel Co., The.

Pump Shafts, Monel Metal.
International Nickel Co., The.

Pumps, Hydraulic.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Pumps & Pumping Mchy.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Pumps, Vacuum.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Punching and Shearing Machines.
Ryerson & Son, Joseph T

Pushers, Coal.
Standard Stoker Co.

Pyrometers, Superheated Steam.
Superheater Co., The.

Rail Anchors.
Bethlehem Steel Co.
P. & M. Co., The.

Rail-Bonds.
American Steel & Wire Co
General Electric Co.
General Railway Signal Co
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co
Westinghouse Elec. & Mfg Co.

Rail Braces — (See Braces, Rail).

Rail Reclamation Equipment
Ryerson & Son, Joseph T

Railroad Shops.
United Engineers & Constructors, Inc.

Rail Splice Plates — (See Joints, Rail).

Railroad Structures — (See Engineers and Contractors; also Building).

Rails.
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Inc Joseph T.
Tennessee Coal, Iron & Railroad Co.
Thomson Rail Corp.

Railway Signals.
General Electric Supply Corp.

Rattan.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Receivers, Air.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.

Recorders, Speed & Cut-off Valve Pilot Co.

Rectifiers for Signal Work
General Electric Co.
Railroad Supply Co.
Union Switch & Signal Co

Reducing Valves.
Vapor Car Heating Co. Inc.

Reflectors, Headlight.
Pyle-National Co., The.
Sunbeam Electric Mfg. Co

Refrigerators.
Wine Railway Appliance Co.

Regulators, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Relays.
General Railway Signal Co
Railroad Supply Co.
Union Switch & Signal Co
Westinghouse Elec. & Mfg. Co.

Removers, Paint & Varnish.
Oakite Products, Inc.

Repair Parts, Stoker.
Standard Stoker Co.
Q & C Company, The.

Retorts, Creosoting.
Graver Tank & Mfg. Corp.

Reverse Gear, Power.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Rivet Cutters.
Ingersoll-Rand Co.

Riveters, Hydraulic.
Birdsboro Steel Foundry & Machine Co.

Riveting Machines.
Ingersoll-Rand Co.

Rivets.
Inland Steel Co.
Neely Nut & Bolt Co.
Ryerson & Son, Joseph T.
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Russell, Burdsall & Ward Bolt and Nut Co.

Rods.
Neely Nut & Bolt Co.

Rolled Steel.
Carnegie Steel Co.

Roller Bearings—(See Bearings, Roller).

Rolls, Bending & Straightening.
Birdsboro Steel Foundry & Machine Co.

Roof Slabs, Concrete.
Federal American Cement Tile Co.

Roofing, Asbestos.
Carey & Co., Philip, The.
Johns-Manville Corp.
Lehon Co., The.

Roofing, Buildings.
Armco Railroad Sales Co.
Carey Co., Philip, The.
Lehon Co., The.
Johns-Manville Corp.
Superior Sheet Steel Co., The (Division of Continental Steel Corp.).

Roofing, Car.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey & Co., Philip, The.
Hutchins Car Rfg. Co.
Johns-Manville Corp.
Lehon Co., The.
Superior Sheet Steel Co., The (Division of Continental Steel Corp.).
Tuco Products Corp.
Union Metal Products Co.

Roofing, Corrugated.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey Co., Philip, The.
Johns-Manville Corp.

Roofing, Tile.
Federal American Cement Tile Co.

Roofing, Tile, Cement.
Federal American Cement Tile Co.

Roofing, Tin.
American Sheet & Tin Plate Co.

Rope, Wire — (See Wire Rope).

Rust Preventatives.
Dearborn Chemical Co.
Oakite Products, Inc.

Safe Ends.
National Tube Co.

Sand Drying Plants.
Roberts & Schaefer Co.

Sanitary Products.
West Disinfecting Co.

Sash Balances.
Tuco Products Co.

Saws, Circular Metal.
Ryerson & Son, Joseph T.

Saws, High Speed, Friction.
Ryerson & Son, Joseph T.

Saws, Portable Rail.
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Fairbanks-Morse & Co.

Scrapers, Wheeled and Drag.
Western Wheeled Scraper Co.

Screens, Passenger Car.
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Seats, Car.
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Seats, Coach.
Brill Co., The J. G.

Shafting.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.
Standard Steel Works Co.

Shapers.
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Shapes, Pressed Steel.
Pressed Steel Car Co.
Sellers & Co., Inc., Wm.

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Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheds, Train.
American Bridge Co.
Inland Steel Co.

Sheets, Black and Galvanized.
Allegheny Steel Co.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Inland Steel Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Blue Annealed.
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Sheets, Building, Special Car, Corrugated & Plain.
Armco Railroad Sales Co.

Sheets, Corrugated.
American Sheet & Tin Plate Co.
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Ryerson & Son, Joseph T.

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Ryerson & Son, Joseph T.

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Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Iron & Steel.
Armco Railroad Sales Co.
Bethlehem Steel Co.
Superior Sheet Steel Co., The (Division of Continental Steel Corp.).

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American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Inland Steel Co.
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Sheets, Polished or Planished Iron.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.

Sheets, Steel.
Armco Railroad Sales Co.
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General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
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Union Switch & Signal Co.

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General Railway Signal Co.
Union Switch & Signal Co

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Tubes, Boiler.
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Reading Iron Co.

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Tubing, Seamless Steel.
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Underfloor Duct, Fibre and Metal.
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Pressed Steel Car Co.
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Birdsboro Steel Foundry & Machine Co.

Valves, Piston.
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Valves, Pop, Safety & Relief.
Ashton Valve Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co.

Valves, Pressure Regulating.
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Valves, Throttle.
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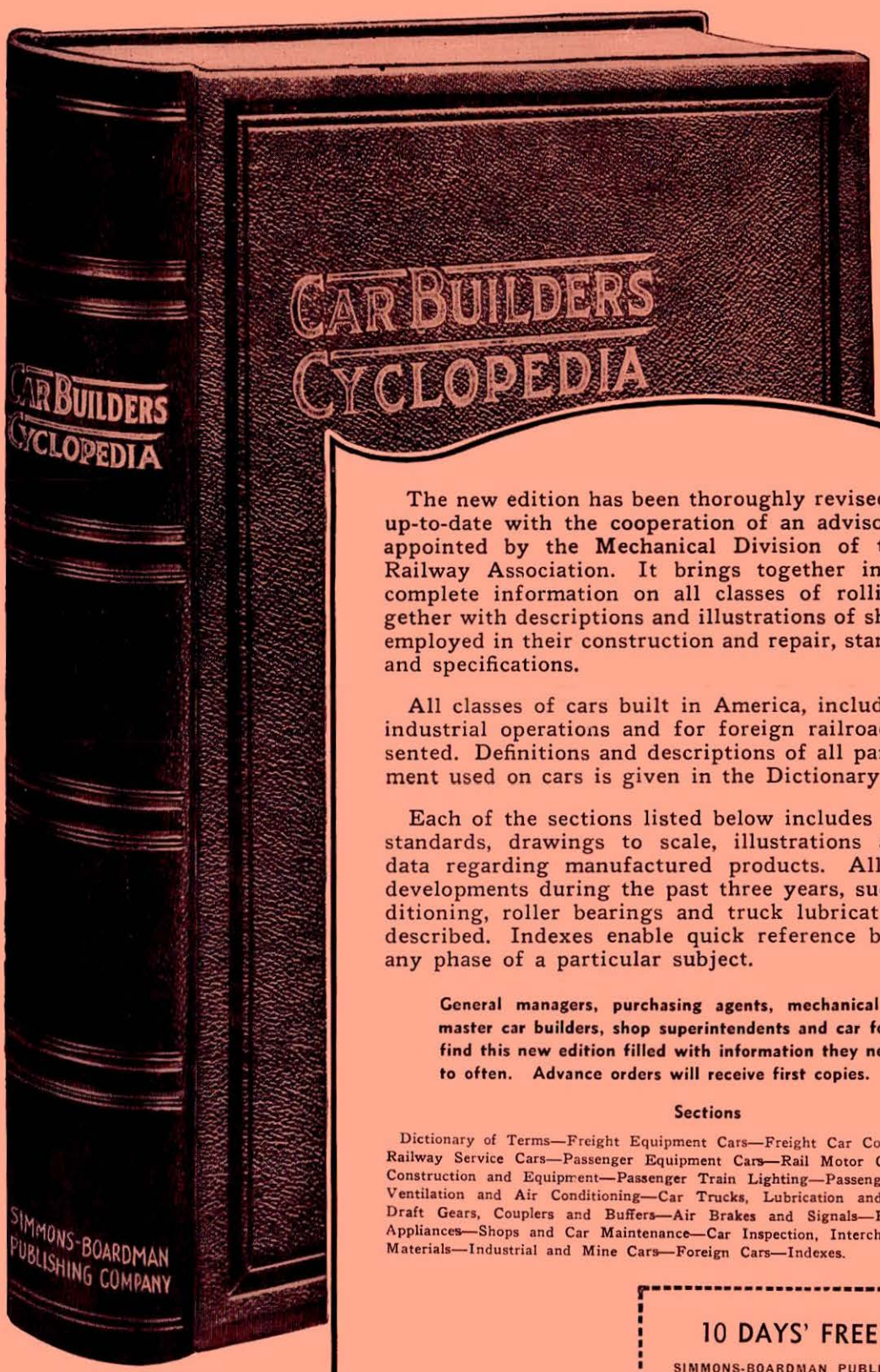

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